THE GAS JOURNAL

AUGUST 24, 1932

Vol. 199 84th Year No. 3614

A Glance at the Contents—

Technical Signpost to the "Journal."

Published to-day is the "Technical Signpost to the 'JOURNAL,'" which covers the outstanding articles of technical interest which have appeared in the April-June Volume. [p. 400.]

Sales Methods of Ballymena.

An insight into the sales methods adopted by the Ballymena Gas Undertaking is given by Mr. C. W. Surman in a paper read before the Irish Association of Gas Managers at their Annual Meeting in Dublin. [p. 407.]

Novel Advertising Device.

The "Water-Flash Chromo-Ad."—an ingenious display device designed by Mr. A. M'I. Cleland, Distribution Superintendent to the Belfast Corporation Gas Department—is described and illustrated in our correspondence columns. [p. 390.]

Testing Heat-Insulating Bricks.

An account is given by Mr. T. H. Blakeley and Prof. J. W. Cobb of work carried out in order to provide an apparatus, comparatively simple in construction and operation, which could be employed to provide makers and users of heat-insulating bricks with information as to the quality of these products, particularly as regards their thermal conductivity. [p. 410.]

A Competition for 1933.

The particular attention of members and students of the Institution of Gas Engineers is directed to a Papers Competition which is being organized by the Public Works, Roads, and Transport Congress, 1933. The first prize is a Gold Medal and one hundred guineas. [p. 391.]

Continuous Vertical Retorts.

M. C. Mothon describes tests carried out at the Clichy Works of the Paris Gas Company on continuous vertical retorts with recuperators and regenerators. This important contribution to the study of carbonization in continuous vertical retorts will be found on p. 393.

The "Gas Unit."

"There is no doubt that the electric unit at a small price appeals to some of the public, and this has induced some gas authorities to adopt a similar method and charge by the unit. To my mind, there is no objection to this, provided that, for comparison's sake, the gas unit is the same as the electric—viz., 3412 B.Th.U.—but when 4000 B.Th.U. is suggested (which is over 17 p.ct. more) and has even been adopted by some gas authorities, this in a large measure defeats its own object, as the public could not be expected to realize the difference or bear it in mind."—From the Presidential Address of Mr. L. G. Young to the Irish Association of Gas Managers. [p. 405.]

Forthcoming Engagements

Sept. 1.—ASSOCIATION OF STATUTORY METER INSPECTORS.—Annual Meeting in Edinburgh.

Sept. 5-8.—ASSOCIATION OF PUBLIC LIGHTING ENGINEERS.—Annual Conference in Blackpool.

Sept. 8.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting in Ayr.

Sept. 13.—INSTITUTION OF GAS ENGINEERS.—Meetings of Finance Sub-Committee, 10 a.m.; Finance Committee, 10.30 a.m.; Executive Committee, 11 a.m.; Gas Education Executive Committee, 4 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 13.—NATIONAL GAS COUNCIL.—Meeting of Central Executive Board. There will be no meeting of the Board or of the Central Committee of the Federation of Gas Employers during August.

Sept. 13.—B.C.G.A.—Meeting of the General Committee at 4 o'clock approximately, 28, Grosvenor Gardens, S.W. 1.

Sept. 14.—INSTITUTION OF GAS ENGINEERS.—Meetings of Purifiers Sub-Committee, 10.15 a.m.; Gasholders Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 15.—S.B.G.I.—Meeting of Council in the afternoon.

Sept. 19.—INSTITUTION OF GAS ENGINEERS.—Meetings of Calorimeters Sub-Committee, 2.30 p.m.; Sir Arthur Duckham Memorial Fund Exploratory Committee, 4.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 20.—INSTITUTION OF GAS ENGINEERS.—Meetings of Joint Research Committee, 10 a.m.; Liquor Effluents and Ammonia Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 21.—INSTITUTION OF GAS ENGINEERS.—Meetings of Meters Committee, 10.15 a.m.; Tar Sub-Committee, 12 noon; Committee on the Admittance of Chemists to Corporate Membership, 2.30 p.m., 28, Grosvenor Gardens, S.W.1.

Sept. 22.—WALES AND MONMOUTHSHIRE ASSOCIATION.—Meeting at Porthcawl.

Sept. 26 to 28.—B.C.G.A.—Annual Conference at Leeds.

Sept. 30.—INSTITUTION OF GAS ENGINEERS.—Meeting of General Research Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 4.—INSTITUTION OF GAS ENGINEERS.—Meeting of Sir Arthur Duckham Memorial Fund Committee, 3 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 7.—NORTH OF ENGLAND ASSOCIATION.—Autumn Meeting.

Oct. 10.—INSTITUTION OF GAS ENGINEERS.—Meetings of Finance Sub-Committee, 2 p.m.; Finance Committee, 2.30 p.m.; Executive Committee, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 11.—INSTITUTION OF GAS ENGINEERS.—Meetings of Council, 10 a.m.; Board of Examiners, 12.15 p.m.; Gas Education Committee, 4 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 13.—INSTITUTION OF GAS ENGINEERS.—Meetings of Joint Lighting Committee, 11 a.m.; Gas Appliances Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 20.—INSTITUTION OF GAS ENGINEERS.—Meetings of Refractory Materials Joint Sub-Committee, 11 a.m.; Pipes Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

EDITORIAL NOTES

Gas in Ireland

THE Gas Industry in Ireland has not had an easy time during the past few years, and is not likely to have its difficulties minimized as a result of the present situation. For some years there has been widespread comment on the Shannon Scheme for the generation of electricity, but this has probably done more good than harm by making individual gas undertakings set their own house in order so as to meet electrical competition when it arrived. When the Shannon Scheme was launched popular opinion had it that the Gas Industry would no longer be required to meet the needs of the community. The net effect, however, has been to increase the sales of gas, thanks to a determined effort on the part of the Gas Industry to extend to the consumer better facilities for the purchase and installation of gas-using appliances of modern type, and to the realization, put into practical effect, of the benefits of showing the public how gas can serve them to-day. During the past two years the consumption of gas in Ireland has increased by 1½ p.ct. and the consumers by 11,600—an excellent achievement considering the mildness of the past winter and the serious trade depression through which the country is passing. It shows conclusively that the Gas Industry has by no means been crushed by the menace of electrical competition. The difficulties of the Irish Gas Industry are certainly increased by the Government's failure to see its viewpoint in regard to the imposition of a tariff on British coal. In spite of a deputation representative of the gas undertakings concerned, which placed before the Government a clear statement of the hardships which would be imposed if their decision were carried out, there has been no yielding; and the Industry is faced with having to pay 5s. more per ton for British coal.

In spite of all, however, the meeting of the Irish Association of Gas Engineers and Managers held in Dublin last week commenced and ended with a note of optimism and a keen determination on the part of its members to do all possible to further the cause of gas. Both the Presidential Address of Mr. L. G. Young and the two papers presented at the meeting—one by Mr. F. G. McElwee and the other by Mr. C. W. Surman—are of a practical nature coming from men who are in charge of small undertakings and appreciative of the advantages as well as the disadvantages which attach to undertakings of the size. Among the advantages, one of the most important is that the manager of the small concern has, with modern gas-making plant at his disposal, far greater opportunities than ever before of attending to the sales side. We have said on many occasions that a large gas-making plant is only a series of smaller units; and this was one of the prominent notes struck at the meeting. As a staunch advocate of carbonization in vertical retorts, Mr. McElwee pointed to the ease with which a small installation can make gas of a consistent quality with the minimum of attention, though, of course, regular technical control is necessary. This technical control, however, need not occupy the whole time of the manager, who is thus able to attend to the equally important aspect of gas selling as distinct from gas making. Mr. McElwee's paper is a pæan of praise for continuous vertical carbonization and for the Glover-West retort in particular, great emphasis being laid on the remarkable flexibility of the plant, the low labour costs, and the fact that the man responsible for the working of the installation is no longer dependent upon human whim, but, instead, can place reliance on control instruments. In brief, the small gas-making plant of to-day, with adequate supervision, is thoroughly capable of satisfying the first tenet of good gas supply—gas of a uniform quality for distribution.

Value of Demonstration

IT has been questioned in the past whether money spent on showrooms is wisely expended in regard to the finances of the small undertaking. The answer to any doubts on this score is to be found in the results obtained by every concern which has had the courage to erect suitable premises where gas consumers and the general public may have demonstrated to them the advantages of up-to-date gas-using apparatus; and further testimony of no uncertain nature is the paper by Mr. Surman, who gives an account of the success which has followed the inauguration of showroom premises at Ballymena. One of the points he makes is that, unless the Gas Industry is prepared to show the public what it can do, the public will remain quite ignorant of the services which gas can offer. Five years' showroom activities at Ballymena have provided excellent proof of this. "It was astonishing," says Mr. Surman, "to find that the public generally had no idea of what gas can accomplish before the showroom work was started." Moreover, the success of showroom demonstration acts as a catalyst to wider sales endeavours, such as taking space at exhibitions, arranging cooking demonstrations, inaugurating more flexible schemes for the hire of appliances, the maintenance of existing installations (particularly lighting fittings), and schemes for paying for appliances through the meter. The point is that enthusiasm begets enthusiasm, and the snowball of gas sales grows.

Moreover, a thoroughly efficient gas installation provides an example for others to follow—a fact which is well brought out by Mr. Surman in connection with the lighting of shops even when those shops had already been wired for electricity. The results of installing what may be termed stand-by lighting have been most gratifying. During last winter several shop-owners already using electricity were persuaded to install gas as an alternative means of lighting, stress being laid on the useful increment of heat which accompanies gas lighting; and Mr Surman has found that these gas lighting units have been used to such an extent that the total consumption of these consumers was only about 10 p.ct. less than it was before electricity was introduced. This is an excellent record, and shows that there is ample room for optimism in regard to the future of gas in competition with electricity provided the proper means are taken to ensure gas sales.

Continuous Verticals in France

THE process of gas production in continuous vertical retorts is so firmly established in this country that any paper contributing to the knowledge of the subject is of general interest to gas engineers. Although it may be claimed that this type of plant was brought to commercial success in Great Britain, other countries have not been backward in appreciating the merits of the process, and plants are now to be found throughout the world.

Some years ago the Paris Gas Company investigated this method of carbonization at their test works, and as a result they decided to equip the Clichy Works with Woodall-Duckham continuous vertical retorts with a gas-making capacity of 18 million c.ft. per day. This construction programme is now complete, and the Paris Gas Company have had the opportunity of summing up the performance of their new carbonizing plant. Taking advantage of progress and experience, they have built three different types of plant. One house consists of 64 recuperative retorts of firebrick construction, a second house consists of 64 recuperative retorts of silica construction, and the third of 80 regenerative retorts of silica construction. In all cases the retorts are heated by clean producer gas made in mechanical producers of the Marischka type. All the plants have been built by the

Compagnie Générale de Construction de Fours, the licensees of the Woodall-Duckham system in France. The Paris Gas Company have been closely associated in the design of the regenerative retorts. To judge the performance of any bench, arrangements have been made for two entirely separate systems of mains, one coupled to the bench under test, the other to the remaining benches in operation.

In view of its general interest we publish in our issue to-day a paper by M. C. Mothon, of the Paris Gas Company, presented to the Union Syndicale de l'Industrie du Gaz en France, describing his experiences and tests in continuous vertical retorts with recuperators and with regenerators. In introducing his subject, M. Mothon draws attention to the great difficulty in obtaining truly comparative information between different types of carbonizing plant. Factors such as quality of coal, nature of materials employed in retort construction, carbonizing temperatures, the physical and chemical properties of coal—all have their influences on results. At Clichy it has been possible to study three different types of continuous vertical retorts under comparable conditions. Hence the importance of the deductions which the author draws and the value of the paper to gas engineers throughout the world.

Regeneration v. Recuperation

Before discussing his tests, M. Mothon gives expression to interesting opinions on the much discussed subject of the comparative heat conductivity of firebricks and silica bricks. It is his definite opinion that work in Paris indicates the superior conductivity of silica bricks, and he quotes the experience on a plant of inclined chambers. After reconstruction from firebrick to silica it was possible to carbonize in the same time while maintaining 100° C. lower temperature. Apart from this factor of higher heat conductivity, it is pointed out that the greater crushing strength of silica enables high combustion chamber temperatures to be maintained with safety. A striking indication of the importance of the replacement of firebricks by silica bricks in continuous vertical retorts of the same type has been shown at Clichy, an increase in throughput from 6·5 tons to 9·2 tons per retort being obtained when working on the same coal.

M. Mothon gives full details of his tests on the three types of continuous vertical retorts. It is to be noted that the main differences apply to methods of heating and materials of construction. A number of important deductions, which we can but indicate in these columns, are drawn from the tests. It is shown that the throughput of a retort is largely determined by the nature of the coal, throughputs varying from 6·4 to 9·2 tons on a given retort. The interesting suggestion is made that this offers a means of meeting peak loads by storing some of the easily worked coals for such emergency. Coupled with the known methods of controlling output by temperature alteration, amount of steam admission, and so on, it is indicated that the flexibility of continuous vertical retorts may be regarded as varying over the limits 1:2. Comparing the results between firebrick and silica retorts, the main improvement is that of increased throughput already referred to. There is very little difference in fuel consumption, but more steam is recovered in the waste-heat boilers working in conjunction with the silica settings. The comparative results between the silica retorts with recuperative and regenerative heating make interesting reading. Greater throughputs per retort, increased yield of therms, and lower fuel consumptions are claimed for the latter method of heating. The author indicates that his own preference is for the regenerative setting for his particular conditions.

It is interesting to compare this type of plant with the latest types of continuous vertical retort plant built in Great Britain—which, whether of the Woodall-Duckham or Glover-West systems, are to a large extent non-recuperative. In the first place, it is apparent that the regenerative setting must of necessity be more expensive in first cost than the non-recuperative type. Secondly, as regards fuel economy, the relative merits of the regenerative and non-recuperative types of plant appear to depend on whether or not steam is required in the works. If no steam is required from waste-heat boilers, then regenerative settings give a lower net fuel consumption. If steam production is a valuable asset, there may be no justification for regeneration purely on the grounds of fuel economy. Thus, in the table showing the B.Th.U. consumed in the setting per pound of coal carbonized, with due regard to the steam used for steaming and the steam produced in the waste-heat boiler, it is shown that the net fuel consumed in the setting with the non-recuperative Woodall-Duckham type as employed in England is less than that in the regenerative type of Woodall-Duckham retorts as employed at Clichy.

The extensive adoption of waste-heat boilers would seem to indicate that gas engineers in this country are finding this an economical way of raising their steam; and this factor would appear to limit the use of regenerative settings for English conditions. But, as M. Mothon says, each type has its advantages.

We feel that British literature on continuous vertical retort carbonization receives a material addition by the publication of M. Mothon's paper, and we take this opportunity of expressing our appreciation for his permission to publish it in full.

A Competition for 1933

We call the attention of our readers to an important Competition which is being organized by the Public Works, Roads, and Transport Congress in connection with the Congress and Exhibition to be held in London in November, 1933. Prizes consisting of medals and substantial money awards—the First Prize being a Gold Medal and 100 guineas—are being given for the papers which, in the opinions of the adjudicators, contribute most materially to the advancement of local government in the services covered by the Congress. These services, of course, include Gas Supply, and the Institution of Gas Engineers is represented on the permanent Organizing Committee of the Congress by Mr John Terrace, a Past-President of the Institution, and Mr. J. R. W. Alexander, the Secretary. A list of suggestions for subjects for papers for the guidance of members of the Gas Industry will be found, together with particulars of the Competition, on later pages of our issue to-day. These suggestions will be helpful, though it is understood that they may be disregarded or used in combination provided the scope of the Congress is adhered to. In any case the sixteen subjects listed provide a wonderful choice; and it is to be hoped that a large number of papers on gas supply will be submitted in connection with the Competition, the closing date of which is Dec. 31 of this year. The Gas Industry has an excellent representation at the Congress, and, as before, a special session will be set apart at the Congress in November of next year, to be held under the auspices of the Institution of Gas Engineers, when the chair will be occupied by the President and papers of interest to the Gas Industry will be presented. Every encouragement will be given in the Gas Industry to those entering the competition, which certainly deserves hearty support.

The Egg-Timer

It is always a thankless task to pull-up a speaker who is exceeding the time limit, which no doubt explains why it is not done so often as it should be. How much better if, so to say, he could be induced to pull himself up—if, as the sands of time were running out, the speaker could be brought to realize the fact without interruption, and so be enabled nicely to round off his argument before resuming his seat, instead, perhaps, of having his conclusions obscured by sudden, but necessary, action on the part of the Chairman. And the doctors, who seem unable to cure some ills, have come along stoutly with a remedy for this particular trouble. The egg-timer has been promoted from the kitchen to the lecture-theatre—no less! It is to be hoped that the kitchen will not suffer as a consequence, and that its loss will be the gain of the lecture-theatre. At any rate,

the doctors themselves on this occasion have taken their own medicine, and have found it beneficial.

These doctors were the members of the British Medical Association, who at their recent congress in London were divided into sections. The President of each section, we learn, was provided with an egg-timer; and as each doctor rose to speak, the Chairman turned the glass and placed it in full view. "As the sand ran through, and the speakers saw the moments slipping away," the "Evening Standard" reporter continues, "the effect was so salutary that not one exceeded the ten minutes allowed." An efficiency of 100 p.ct., in this case!

Excellent—but does the egg-timer provide against all eventualities? Suppose a doctor—perish the thought—had desired to occupy the time of the meeting for only one-half of his "allotted span," would he have been expected to remain silent on his feet for the other five minutes, or would the meeting have been suspended while the sand of the egg-timer ran through? Can it be, after all, that the virtue of this novel device in curtailing some speeches to ten minutes, will be nullified by its vice in increasing the length of other speeches to this extent? In other words, that the egg-timer may "cut both ways?"

OBITUARY

MR. GLOVER CLARK.

We regret to have to announce the death of Mr. Glover Clark, which took place at his residence, St. Leonards-on-Sea, on Aug. 15, in his 74th year.

Mr. Glover Clark was the chief representative of Messrs. Thomas Glover & Co., Ltd., Gas Meter Manufacturers, for over thirty years. From March, 1920, till October, 1928, he was a Director of that Company and also of the associated Companies—Messrs. R. & A. Main, Ltd., Gas Stove Manufacturers, and Messrs. Glover & Main, Ltd., Gas Engineers. Owing to failing health he resigned his Directorships of these Companies in 1928 and retired to St. Leonards-on-Sea. Mr. Glover Clark rendered invaluable service to the Companies, and his death will be regretted by his many friends in the Gas Industry.

The funeral took place at the New Southgate Cemetery on Thursday, Aug. 18, and was attended by his two sons, Mr. Charles G. Clark and Mr. John Clark, and his nephew, Mr. McKinnon Clark; and, representing Messrs. Glover & Main, Ltd., and allied Companies, Mr. Kenneth Aird and Col. W. R. Glover (Managing Directors), Mr. A. J. Crichton (Secretary), Mr. C. L. Coggin (Accountant).

CORRESPONDENCE

Storage of Coal

SIR,—Kindly allow me, through the medium of your "JOURNAL," to thank "Observer" and Dr. Foxwell for their observations on the above subject.

Our total coal carbonized per annum is 40,000 tons. The 9000 tons of stock coal represents about eight weeks' requirements at the "full load" period (normal working and output). C.W.G. is available, but only used in emergency, owing to higher cost of working.

The stock prior to the 1926 strike was 6000 tons.

The coal and nuts as purchased are of good quality, containing not more than 5 p.ct. of ash.

When carrying out the experiment of emptying a bay and replacing with fresh coal, I shall do as Dr. Foxwell suggests and test one or two wagons, both on a large scale and on a laboratory scale, against the fresh deliveries.

As regards stocking large coal, this would not only cost more in the first place, but would also cost more to remove from stock, as it could not be grabbed.

The comments are much appreciated and will help me to decide a definite policy.

Yours, &c.,
"STOCK COAL."

Aug. 18, 1932.

Holding-Down Bolts for Disc-Type Gasholders

SIR,—I consider Mr. Milbourne's letter of Aug. 13, published in the "JOURNAL" for Aug. 17, to be merely an evasion of the question at issue.

But, as he assumes that the triangles concerned in the false equation, $\frac{b}{m} = \frac{a}{R}$, are in the same plane, although the resistances b are situated on either side of the radius R aforesaid; as he infers that triangles are "similar" when two sides (only) of the one are parallel to the corresponding two sides of the other (remarkable Geometry!); as he calls my reactions "displacements;" and as he totally ignores the fact that in my formula all the component resistances are allowed for by being concentrated as resultants along a radius concerned—then it is time to close the discussion.

I have come to the conclusion that Mr. Milbourne either will not admit an error when pointed out to him, or he does not understand the problem concerned in the article he tries to criticize.

However, the ridiculous mistake in his own formula and the article responsible for it is *there*, for anyone else to see, whether he admits it or not.

Yours, &c.,
A. GADD.

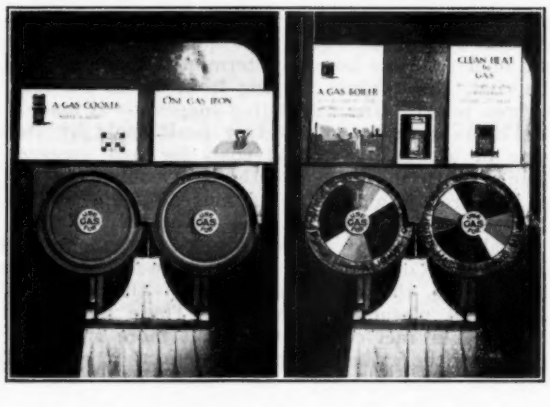
62, *Barton Arcade, Manchester,*
Aug. 19, 1932.

The Water-Flash Chromo-Ad.

SIR,—The accompanying illustrations show a device which has lately been brought out at the workshops of the Outdoor Department of the Belfast Corporation Gas-Works and which has been designated the "Water-Flash Chromo-Ad." It illustrates again the flexibility of gas.

Briefly, the device consists of two discs, each 18 in. in diameter, bearing suitable advertising matter on their outer rims, the remainder of the face of each disc being covered with seven radiating strips of vivid colour, once repeated.

A small quantity of water is periodically and automatically dropped on to a heated surface and is immediately flashed into steam. The steam so generated is then led against vanes behind the discs and causes them to revolve with great rapidity, producing a very attractive rainbow effect, which effect it is, of course, not possible to reproduce in the illustration showing the discs in action.



The quantity of water admitted to the heated surface may be varied at will, though an ounce at a time is quite sufficient. The water is admitted half a minute after the discs have come to rest, though this period may be varied.

The moving parts of the device are hidden by a screen on the face of which any appropriate advertisement may be posted; or smaller and interchangeable advertisements may be rested on a ledge at the bottom of the screen, as shown in the illustrations.

The heat required is supplied by a small boiling ring. The device is free from danger and quite foolproof, and offers a very picturesque and attractive window display.

Yours, &c.,
A. M'I. CLELAND, Distribution Superintendent.
Belfast Corporation Gas Department,
Aug. 16, 1932.

THE NEWS OF THE WEEK

Institution of Gas Engineers.—Copies of the recently issued British Standard Specification for Tungsten Filament Electric Lamps (No. 161-1932), which supersedes No. 161-1930, may be obtained, price 2s. each, from the Secretary, the Institution of Gas Engineers, 28, Grosvenor Gardens, London, S.W. 1.

Gas Supply in Belgium.—The Compagnie Générale de Gaz et d'Electricité has lately secured an extension of its gas supply concessions in the Brussels district, and in conjunction with the Société Intercommunale Bruxelloise du Gaz it has lately organized a new concern to be known as the Société Bruxelloise du Gaz to centralize and operate the gas supply services in the northern suburbs of Brussels.

The Principal Swiss Gas Undertakings continue to make steady progress. Thus the sales of gas during last year by the municipal gas-works in Basle amounted to 1038 million c.ft., compared with 989 millions in 1930—an increase of just over 5 p.ct. Similarly, the report for last year of the gas-works in Solothurn, which supply gas not only to that town but to thirteen outside districts, shows that the production reached a total of 104 million c.ft., contrasted with 97 millions in 1930—an advance of 7·7 p.ct.

The Committee of the Hungarian Gas-Works Association at the recent annual meeting in Budapest reported that the production of the ten gas undertakings in Hungary amounted during last year to 3,647,888,000 c.ft., as contrasted with only 3,619,774,000 c.ft. in 1930—an increase of 28,114,000 c.ft. The gas-works in Budapest, which supply gas not only to that city, but over a large outside district, were responsible for an output of 3,333,095,000 c.ft., or over 91 p.ct. of the total. Five out of the ten works showed an increased output and five a decrease.

Gas Supply in Alsace.—The existing concession under which the Compagnie du Gaz de Mülhouse supplies the town of Mülhouse, Alsace, with gas comes to an end in April of next year. Terms have, however, now been arranged whereby the works and distribution system of that Company will be taken over and continued for a further thirty years by a new concern known as the Société Mülhousienne du Gaz, in which both the Municipal Council and the old Gas Company are financially interested, the latter finding 49 p.ct. of the capital of 15 million francs and the municipality 51 p.ct.

Gas Production in Russia.—The gas-works in Moscow, the original plant of which was established in 1865, has recently been reconstructed and considerably enlarged in order to meet the ever-growing demand in the city. According to a report in a recent issue of the "Moscow Daily News," Moscow now holds the eighth place in Europe in the production of gas, which has increased rapidly in recent years—from 438 million c.ft. in 1922-23 to 723 million c.ft. in 1926-27—while for 1930-31, a total of no less than 1,702,307,000 c.ft. is recorded. Furthermore, the production in 1931-32 is expected to attain a total of 2012 million c.ft.

The North London Exhibition.

North London's greatest and most popular annual event, the Home-Lovers' Exhibition, will open at the Alexandra Palace on Oct. 5, and will remain open until Oct. 22, a week longer than last year. H.R.H. Prince George has intimated that he will pay a visit to the Alexandra Palace to inspect the Exhibition on Oct. 15.

The extension of the Piccadilly line to Arnos Grove will render the Exhibition rapidly accessible from any part of the Metropolis, and North London interests are therefore seizing the opportunity of making the Exhibition the finest ever seen at the Alexandra Palace and fully representative of the trade and industrial activities in the great and rapidly expanding suburbs of the North, North-East, and North-West area.

To this end the Exhibition, now in its seventh successful year, has been completely re-designed on most attractive modern lines by Mr. E. Cecil Davies, F.R.I.B.A., the well-known Architect. The striking new scheme will provide vast Halls of Light and Colour in which exhibits and special displays will be seen to the best advantage.

Already more than 200 exhibitors have guaranteed their active support, and the exhibits will comprise housing, furnishing and decoration, heating and lighting, labour-saving devices, art, music, wireless, beauty, health and fashion, sports and pastimes, food and cookery, and demonstrations covering a multitude of other interests will be prominent.

As on previous occasions, the Gas Industry will be well represented, the display being in the capable hands of the Tottenham and District Gas Company, in co-operation with other leading firms in the Industry, and there will be a striking "Gas Pavilion" at the east entrance of the Exhibition.

Public Works, Roads, and Transport Congress and Exhibition, November, 1933.

Papers Competition.

The particular attention of members and students of the Institution of Gas Engineers is directed to the Papers Competiton which will be held in connection with the 7th Public Works, Roads, and Transport Congress and Exhibition in London in November, 1933.

Papers for the Competition have to be submitted for adjudication to the Hon. Secretary of the Congress on or before noon on Dec. 31, 1932, the awards consisting of:

1st Prize—Gold Medal and one hundred guineas,
2nd Prize—Silver Medal and fifty guineas,
3rd Prize—Bronze Medal and twenty guineas,
4th Prize—Ten guineas,

with additional awards of five guineas for each paper (excluding those to whom the above prizes are awarded) selected for discussion at the Congress.

The subject of a paper must be one which is covered by the objects of the Congress—viz., Gas, Sewerage and Sewage Disposal, Water Supply, Local Government Organization, Highways and Bridges, Cleansing, Electricity, Housing and Town Planning, Tramways and Light Railways, and Agriculture (Small Holdings, Land Drainage, Land Reclamation, and Agricultural Education).

In Gas Supply the Congress, in co-operation with the Institution of Gas Engineers, has made the following suggestions for subjects for papers for the guidance of competitors, it being clearly understood that such suggestions can in appropriate cases be adopted in combination, or may be disregarded altogether provided the scope of the Congress is adhered to:

(1) The thermal efficiency of the process of gas manufacture.
(2) The use of gas in the heating of public buildings.
(3) The use of National Benzole for transport and other public purposes.
(4) Gas engines for sewage pumping and other public services.
(5) How the Gas Industry can assist the further elimination of smoke from industrial manufactories.
(6) Problems in the public distribution of gas.
(7) Amalgamation of gas undertakings in the public interest.
(8) Street lighting by gas contrasted with street lighting by electricity.
(9) The production of coke as a public utility service.
(10) The supply of electricity by gas undertakings.
(11) The effect of gas on the life of cast-iron and steel mains.
(12) Methods for ensuring the production of wrought iron services in public gas supply.
(13) The use of town gas for therapeutical purposes.
(14) The analysis and sampling of coal used for distillation in gas-works.
(15) Gas cooking and heating for municipal and other housing schemes.
(16) Production of tar suitable for highway purposes.

The prizes will be awarded to the authors of those papers which contribute most materially to the advancement of

THE NEWS—*continued.*

Local Government in the services covered by the Congress. The Competition is open without restriction of nationality, but the staffs of Government Departments will not be eligible to compete, on this occasion. Papers will be presented at the Congress by the authors in person. Papers not awarded prizes may be selected for presentation. A Session at the Congress will be held under the auspices of the Institution of Gas Engineers, when the chair will be occupied by the President, and papers of interest to the Gas Industry will be presented.

Every encouragement will be given in the Gas Industry to persons entering the Competition, for which 24 papers were submitted in the last Competition. The Institution of Gas Engineers is represented on the Permanent Organizing Committee of the Public Works, Roads, and Transport Congress and Exhibition by Mr. John Terrace, M.Inst.C.E., Past-President, and Mr. J. R. W. Alexander, M.A., LL.B., Secretary of the Institution of Gas Engineers, from whom the "Rules and Suggested Subjects" for the Competition and any further information may be obtained. The address of the Institution is 28, Grosvenor Gardens, London, S.W. 1.

Dartford Industrial Development Exhibition.

The above photograph gives a good idea of the extent and lay-out of the very comprehensive display of the South Suburban Gas Company at the Dartford Industrial Development Exhibition, held in conjunction with the great Historical Pageant at Hall Place, Bexley, from July 18 *to* 23 *last, and referred to in the "*JOURNAL*" for July* 27, *p.* 197.

"Sherardizing."

During the year 1900, while carrying out experiments on the heat treatment of metals, Mr. Sherard Cowper-Coles made an important discovery concerning the effect on iron and steel surfaces of heat treatment with zinc powder. He found that when various articles were packed in zinc powder and heated, a rust-proof surface was produced, and he patented this method of steel protection under the name of "Sherardizing," which term was derived from his own name.

An interesting text-book for architects and engineers has been written by G. Petrie and J. C. Mills (published, at 2s. net, by Messrs. Whitehead Brothers (Wolverhampton), Ltd., 32, King Street, Wolverhampton) with the object of explaining as clearly as possible the history, operation, and application of "Sherardizing," and the authors' efforts should certainly assist those who are interested in rust prevention to a clearer understanding of the advantages and limitations of this process.

As "Sherardizing" is a heat treatment, and must be carried out in enclosed containers of limited size, it will be realized that the process is not suitable for universal application. Briefly, the process is as follows: "Sherardizing" uses the product of zinc distillation known as zinc dust. When iron or steel is heated to a certain temperature in this dust, an amalgamation of the two metals occurs, with the formation of an iron-zinc alloy, the action occurring in different degrees and with different results at different temperatures. The process may be compared with that of case-hardening, which causes steel to absorb carbon and become hard, while in "Sherardizing" zinc is absorbed instead of carbon, and the steel becomes rust-proof.

A chapter gives examples of suitable articles for treatment, which at the present time appear to be limited to work 15 in. square by 6 ft. long, and 11 in. square by 15 ft. long. Shorter articles can be treated in sizes up to 24 in. diameter. The limitations of the process are frankly discussed in the book, while further sections are devoted to various finishes, tests, the question of cost, special contracts, and a series of diagrams indicating the uniform zinc impregnation over the entire surface as compared with other deposition processes. A comprehensive index completes this useful little book.

Production of Gas in Moscow.

In the year 1930 Moscow produced 48,224,000 cub.m. of gas. The consumption of gas per head of population in that year was 185 cub.m.

The gas plant in Moscow has recently been re-constructed and enlarged. In 1922-23 the production of gas equalled only 9·6 million cub.m.; in 1926-27 it rose to 20·5 million cub.m.; and in 1931 it was 48·3 million cub.m. The estimated production for this year is 57 million cub.m.

A project is now being considered for the building of a huge gas plant in Moscow, capable of an output of 600 million cub.m. per annum.

Gas Supply Progress in Brazil.

From the recently-issued report of the Brazilian Traction Light and Power Company, Ltd., for last year we learn that the output of gas from the works of its two subsidiary concerns—the Société du Gaz de Rio de Janeiro and the San Paulo Gas Company—during 1931 amounted to 3,615,945,000 c.ft. as compared with 4,037,201,000 c.ft. in 1930, a decrease of about 1·7 p.ct.

Although the decline was partially due to a change over from gas to electricity for public lighting in San Paulo, there was also a slight decline in the number of consumers—from 74,979 to 74,509. Unfortunately the report does not give separate figures for the two undertakings; it shows, however, that the length of the mains in the two cities—Rio de Janeiro and San Paulo—was increased during 1931 from 1014·5 to 1032·8 miles and that the number of stoves, water heaters, and other gas appliances in use advanced during the twelve months from 108,458 to 110,724, or just over 2 p.ct.

At the works in Rio the extension of the main-compressor house and the installation of an additional compressor of 350,000 c.ft. have been completed. A new 14-in. high-pressure main was laid from the works to the Mangue gasholder station, and since the close of the year a main from the works to Botafogo has been completed.

Preservation of Instruments of Historical Importance.

In recent numbers of the lay Press letters have appeared over the signatures of Lord Rutherford and others asking for the co-operation of anyone possessing pieces of apparatus likely to be of historical importance.

In 1925 the Institute of Physics appointed a Committee to advise on the preservation of such apparatus. This Committee is anxious to trace any pieces with which fundamental research in physical science has been carried out, and to arrange for their preservation. The Committee has also entered upon the task of drawing up a catalogue of such pieces. Several pieces of great historical importance have already been secured for the nation, and are now housed in the Science Museum at South Kensington, and the response to the letters recently published has brought to light several other important pieces, Some articles describing and cataloguing such pieces are published from time to time in the Journal of Scientific Instruments.

Many of our readers may have such apparatus in their possession or under their charge, and the Secretary of the Institute of Physics, 1, Lowther Gardens, Exhibition Road, London, S.W. 7, will be grateful for any information that will assist in tracing such pieces or in completing the catalogue.

For the benefit of future historians of physical science it is desirable to have as complete a record as is possible of the work of British physicists, and it is to this end that this task has been undertaken.

(*For further "News of the Week" see p.* 399.)

A Contribution to the Study of : Continuous Vertical Retorts :

Tests carried out at the Clichy Works of the Paris Gas Company on Continuous Vertical Retorts with Recuperators and with Regenerators

Paper read by C. MOTHON before the 55th Congress of the Union Syndicale de l'Industrie du Gaz en France, June, 1932.

In a paper presented to the 1924 Congress, H. Laedlein, a former President of the Technical Association of the French Gas Industry and Technical Director of the Paris Gas Company, gave a very complete analysis of tests carried out between 1921 and 1924 on the La Villette Test Plant on two settings of Woodall-Duckham recuperative continuous vertical retorts.

These tests resulted in a decision to equip the Clichy Works with Woodall-Duckham retorts with a gas-making capacity of 18 million c.ft. per day. However, convinced that the use of regenerators, which had given excellent results with Siemens' horizontal retorts, should be even more justifiable in settings requiring the preheating of the producer gas—which is the case at Clichy where the settings are fired with producer gas made in Marischka producers—the Paris Gas Company installed to their design at the La Villette test plant a regenerative setting of an entirely novel type. Put into operation in 1927, this setting, after some modifications, gave such interesting results that it was decided to install the newest four benches of the Clichy Works with regenerative retorts.

This Works now has three retort houses as follows:

One house of 4 benches each containing sixteen 6½-ton recuperative retorts of firebrick construction. (These benches will be built of silica bricks at the first reconstruction.)

One house of 4 benches each containing sixteen 6½-ton recuperative retorts of silica brick construction.

One house of 4 benches each containing twenty 6½-ton regenerative retorts of silica brick construction.

To enable guarantee tests to be carried out on the benches of the individual retort houses we provided, both for the producer gas and for the coal gas, two entirely separate systems of mains, one coupled to the bench under test, the other to the remaining benches in operation.

This arrangement enabled investigations to be made in succession—

Section A.—A bench of the recuperative type and of firebrick construction.
(Tests carried out in May, 1927.)

Section B.—A bench of the recuperative type and of silica brick construction.
(Tests carried out in January-February, 1932.)

Section C.—A bench of the regenerative type and of silica brick construction.
(Tests carried out in January-February, 1932.)

All those who have given a little thought to the investigation of different types of retorts and, much more so, those who have been called upon to make a choice of a retort system in connection with the construction or modernization of a works have probably, like the author, realized how difficult it is, in view of the widely differing operating conditions, to draw any precise conclusion from the results indicated by the constructors or the users. It seems that things could not be otherwise.

The results, in a word, depend on a variety of factors of which the most important is by no means the type of the plant. The quality of the coal treated, and the nature of the material employed in the construction of the retorts—on this depends the carbonizing temperature—have a predominating effect on the yield of gaseous therms and on the amount of coke consumed as fuel. In the special case of continuous vertical retorts, certain physical or chemical properties of the coal—which analysis does not reveal or else does not explain satisfactorily—play an important part as will be seen later.

Things being so, is it surprising that a comparison of retorts of different types constructed of different materials and handling different coals does not enable definite conclusions to be drawn? With this in mind, we have formed the view that a study of the results obtained by the Paris Gas Company at Clichy in three different types of continuous vertical retorts, under conditions as comparable as possible, would enable us to draw some precise conclusions which would be of general interest to gas engineers.

It is these results which the author presents in this contribution.

By way of introduction it is necessary to describe briefly the regenerative installation C, which is, as indicated earlier, of an entirely novel type. It is unnecessary to describe installations A and B, which are recuperative settings of standard type erected in France by the Compagnie Générale de Construction de Fours, and which only differ from each other in the kind of bricks used in their construction—namely, firebricks in installation A, and silica bricks in installation B.

Waste-heat boilers with superheaters are fitted in the waste-gas systems of installations A and B. As regards installation C, the size of the regenerators was designed with a view to securing, from the heat contained in the waste gas, the maximum possible degree of regeneration for preheating the secondary air and the producer gas. Since the waste gas leaves the regenerators at an average temperature of 155° C., the installation of a waste-heat boiler at the outlet of the regenerators was not considered.

I. Description of Installation C.

CONTINUOUS VERTICAL RETORTS WITH REGENERATORS.

Installation C, comprising ten settings of two retorts of the latest type and of 6½-ton size, occupies, without the regenerators, the same ground space (83·40 ft. by 20·47 ft. =1707 sq. ft.) as a recuperative setting of 16 retorts, but the structure of the regenerators, apart from the settings, occupies a ground space of 81·76 ft. by 11·68 ft. = 955 sq. ft.

Each retort has five heating flues on each side, and these serve alternately for upward travel of the fuel gas and downward travel of the waste gas. Fig. 1 shows the operating features of a retort during the interval between two reversals.

Producer gas, generated in the battery of Marischka producers and completely freed from dust, is drawn by exhaust fans from the battery into a main which runs around the four benches in the retort house and enables the individual producer gas collecting mains of each bench to be supplied from either of their ends A and A1.

After passage through the governor B and the reversing hydraulic valve C, the gas arrives, by way of the collecting main D1, at the reversing box G, traverses the brickwork of the regenerator J and finally reaches the burners. The secondary air introduced by the box H comes, after passage through the regenerator I, into contact with the producer gas at the burners K_1 and K_2. The waste gas produced by the combustion of the producer gas with the air descends the right hand flues after a short horizontal travel at the top of the retort, travels through and heats the brickwork of the regenerators I_1 and J_1 and thence passes by way of the reversing boxes H_1 and G_1 into the collecting main L_1. The safety dampers M_1 and the regulating dampers O_1 being open, the gas is discharged to the chimney R by the agency of an induced draught fan P.

After a variable time, regulated in a manner to be described later, the reversing mechanism comes into play and reverses the direction of flow of the gases. The producer gas and air enter by way of boxes G_1 and H_1, while the waste gas, after traversing the regenerators I and J, which have been cooled during the circulation of the cold gases in the preceding cycle, are discharged to the chimney by the collecting main L.

It is possible to work with natural draught if the damper O is opened. For this purpose, in order that sufficient draught may be available, there has been provided at the base of the main chimney an arrangement, not shown in the diagram, for re-heating the waste gas.

During the tests, the reversals took place every 25

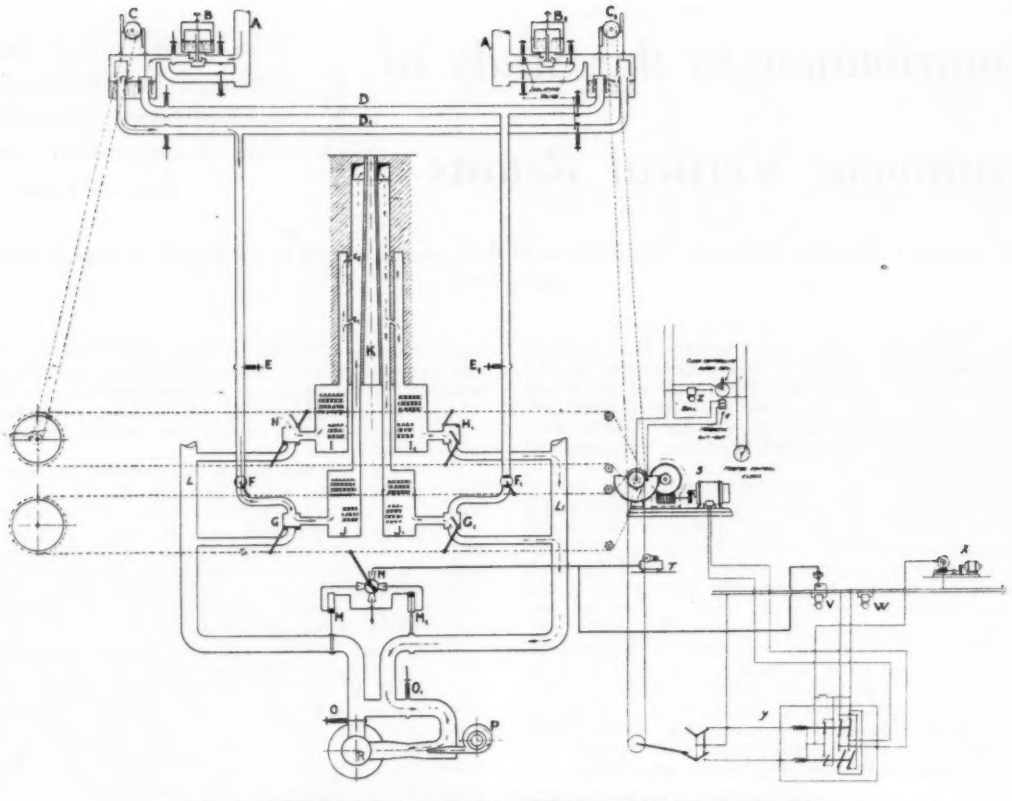


FIG. 1.—REGENERATIVE WOODALL-DUCKHAM RETORTS AT CLICHY.

Diagram showing the flow of gases in relation to the reversing mechanism.

A, A_1.—Producer gas collecting mains.
B, B_1.—Governors.
C, C_1.—Reversing hydraulic valves for producer gas.
D, D_1.—Collecting mains supplying alternately reversing boxes G and G_1.
E, E_1.—Individual control dampers on the collecting mains D, D_1 for regulating the supply of producer gas.
F, F_1.—Rotary valves alternately cutting off collecting mains D and D_1.
G, G_1.—Reversing boxes with flap valves for admission of producer gas and evacuation of waste gas.
H, H_1.—Reversing boxes with two valves for admission of air and evacuation of waste gas.
I, I_1.—Checkerwork of the regenerators.
J, J_1.—Checkerwork of the regenerators.
K_1, K_2.—Nostrils.
L, L_1.—Waste gas collecting mains.
M, M_1.—Valves operated by compressed air.
N.—Valve for the supply of compressed air to M, M_1.
O, O_1.—Shut-off dampers for the waste gas collecting mains.
P.—Induced draught fan.
R.—Chimney.
S.—Reversing motor.
T.—Air compressor.
X.—Circuit maker.
V, W, Z.—Alarm bells.
Y.—Current reversing system operating after the finish of a reversal.

minutes. The reversing system comprises the following appliances:

(1) A circuit maker, X, common to the four benches of the retort house and consisting of a cogged drum driven by an electric motor. The cogs tip over mercury interrupters which supply current to the starting switches of the reversing motors S. The speed of the small motor controlling the circuit maker and the position of the cogs can be altered in accordance with the frequency with which reversals are desired in the individual benches.

(2) A reversing motor, S, which with the help of a winch controls by cables and rods the opening and closing of the air and producer gas flap valves. The large pinion of the winch is formed from a toothed sector of which the length has been limited so that its engagement may be stopped in the event of a cessation to function on the part of the interrupter which will be referred to later.

(3) A limit switch for the finish of the reversal, comprising a contacting sector engaged, with the help of a chain, by a pinion supported from the shaft of the winch and serving to break the current at the end of the reversal and to make automatic provision for the current for the next reversal in such a manner that the direction of rotation of the motor is reversed.

(4) A push-button enabling the reversing system to be put into operation independently of the circuit maker.

(5) Finally, a hand wheel which enables the whole of the reversing mechanism to be operated by hand in case of failure of the current.

Various measures have been taken to prevent loss of producer gas and to insure continuity of the operations of reversal. You will notice that in the position marked on fig. 1, the closing of the valve F_1 and of the hydraulic valve C on the collecting main D renders any loss of producer gas by way of the box G impossible. Similarly, the closing of damper M which shuts off the draught from the collecting main L prevents any loss of producer gas by way of box G. The operation of dampers M and M_1 is effected rapidly and automatically at each reversal by the agency of compressed air. The air is supplied by a compressor T which maintains a constant pressure in a reservoir; admission of the air is assured by the presence of a valve N connected to the reversing mechanism.

A system of illuminated or audible signals gives immediate warning in case of any failure of the mechanism; the operating staff are warned by the appliance V if there is any deficiency of compressed air in the reservoir which operates the dampers and by an appliance W if the reversing motor stops before the end of the operation of opening and closing the flap valves. Z is an appliance consisting of a clock which puts an alarm signal into operation if the reversal, for some reason or other, is not carried out at the end of a fixed time.

Drying and Starting Up Installation C.

The retorts of installation C consist of 134 superimposed courses of 2·36 in. thickness. The top 9 courses and the bottom 33 courses are of firebrick, the middle 92 courses being of silica brick.

Due to the high thermal expansion of silica bricks, especially at low temperatures, drying must be carried out with great care.

To enable the course of expansion of installation C to be followed, a special arrangement was employed. A graduated sheet of enamelled steel, carried on a column, was placed on the top of the retorts. A pointer fixed to the coal hoppers, which are independent of the retorts, has one end in front of the enamelled sheet. Since the pointer

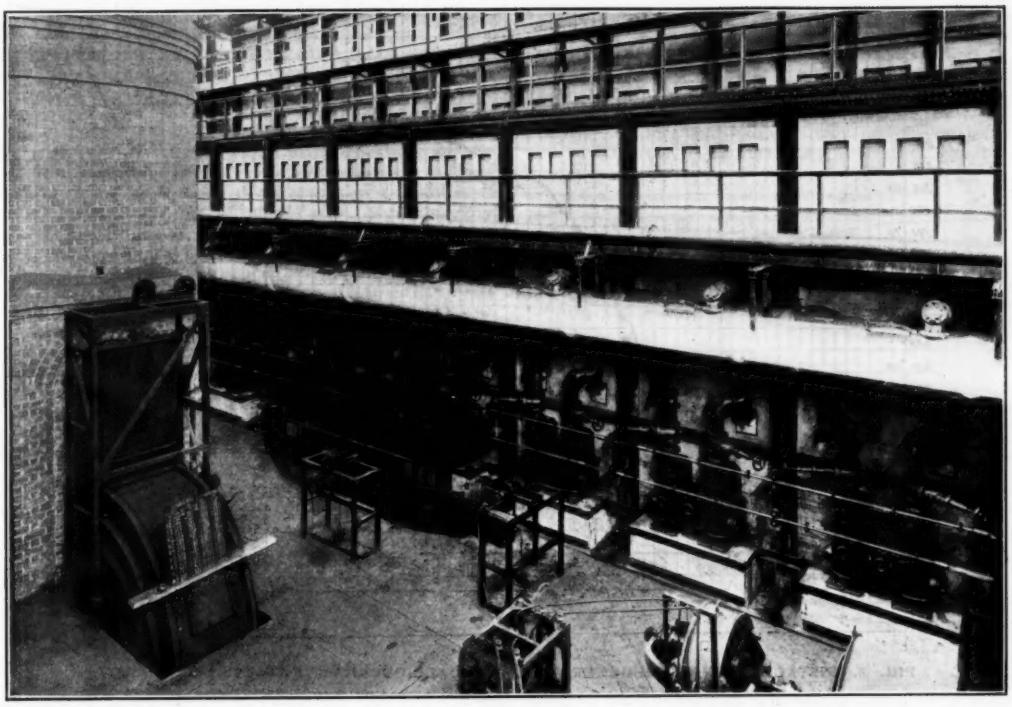


FIG. 2.—BENCH OF REGENERATIVE WOODALL-DUCKHAM VERTICAL RETORTS AT CLICHY.
General view of the reversing equipment (producer gas side).

is stationary and the enamelled sheet follows the movement of the brick, the course of expansion of the setting can be followed by attaching devices of this nature to different parts of the bench.

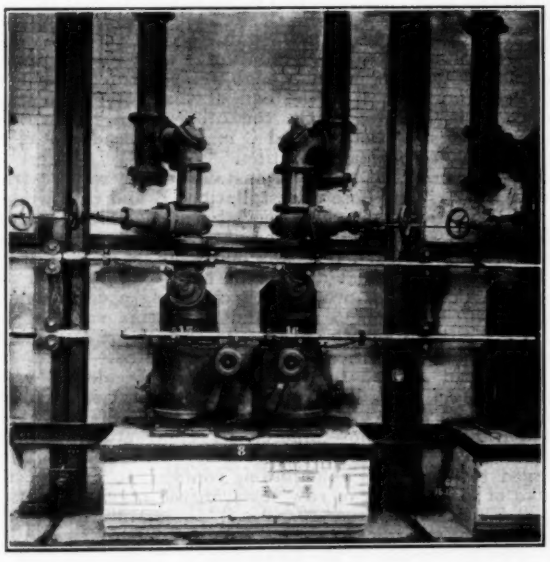


Fig. 3.—Bench of Regenerative Woodall-Duckham Retorts.
Reversal valves (producer gas side).

A curve (fig. 5) shows the vertical expansion of installation C during drying and lighting up. Temperatures were taken at a depth of 10 ft. down the retorts.

Temperature Distribution in Installation C.

The guarantee tests on installation C were not carried out until the cycle of reversals which seemed to be the best for assuring a maximum degree of uniformity in the burners, without exceding at any point or at any time a temperature of 1400° C., had been determined experimentally. The curves in fig. 7, giving the temperature fluctuations at the top and bottom of the combustion flues (fig. 6) between the period of two reversals, show the temperature distribution which was maintained in the setting during the test. Figs. 8 and 9 show, in the form of curves, the temperature of the air, the producer gas and the waste gas leaving the regenerators, during the period between two reversals.

For comparison, fig. 10 shows the temperatures prevailing in the recuperative setting B during its tests.

II. Tests Results on Installations A, B, and C.

The results of the guarantee tests on installations A, B, and C are summarized in the following table which gives details of—

The nature of the coals carbonized.
The weight of coal carbonized per retort per 24 hours.
The make and calorific value of the gas and the fuel consumption.

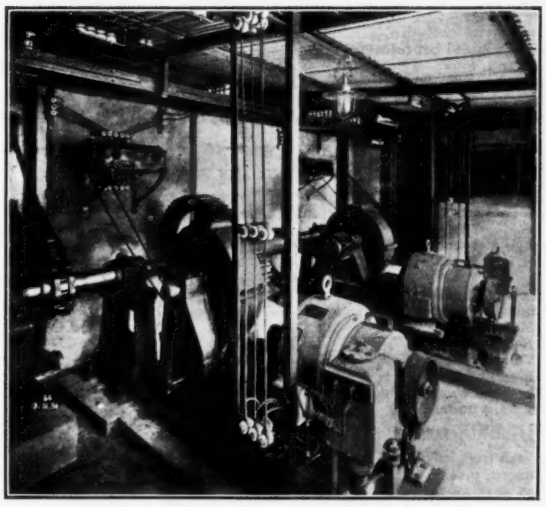


Fig. 4.—General arrangement of the Motors operating the Reversing Equipment at Clichy.

In addition, information is given as to the steam admitted to the retorts and the steam produced in the waste-heat boilers in the waste-gas system of installations A and B.

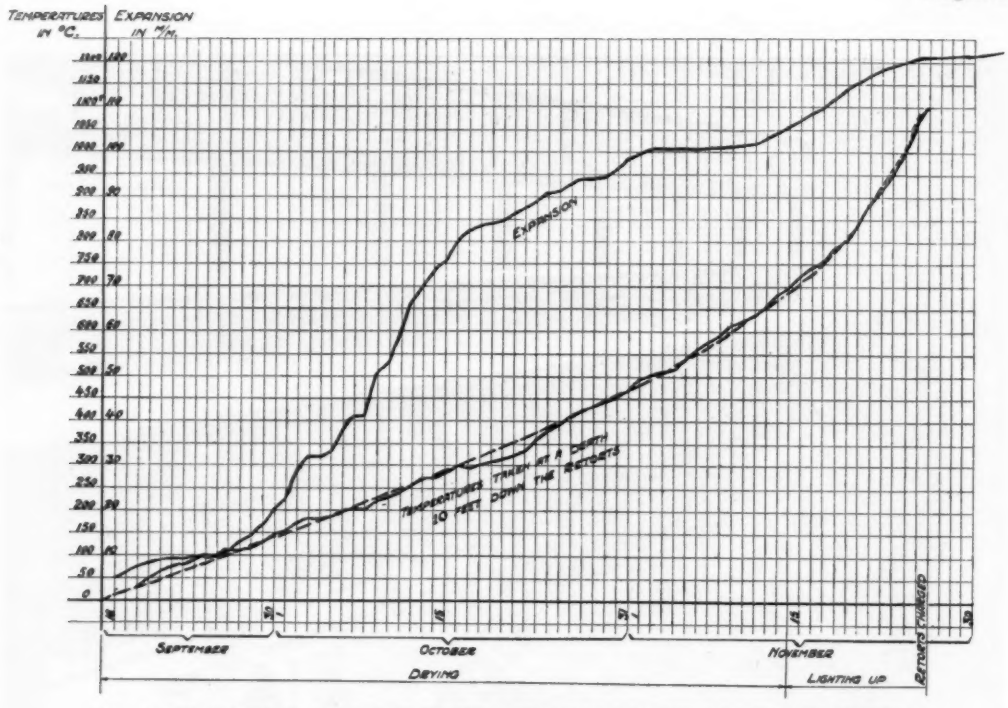


FIG. 5.—INSTALLATION OF REGENERATIVE WOODALL-DUCKHAM RETORTS AT CLICHY.

Curves showing the vertical expansion of the brickwork and the temperature in the retorts. (The data were obtained during the drying-out and lighting-up of Installation C.)

TABLE I.—*Results of Tests Carried Out at the Clichy Works of the Paris Gas Company.*

Installation A—on 1 Bench of Recuperative Firebrick Retorts.
Installation B—on 1 Bench of Recuperative Silica Brick Retorts.
Installation C—on 1 Bench of Regenerative Silica Brick Retorts.

Composition of Coal Carbonized.	50 P.Ct. Saare. 50 P.Ct. Denaby.	Test 1. 50 P.Ct. Saare. 50 P.Ct. Carlton.		Test 2. 30 P.Ct. Saare. 30 P.Ct. Denaby. 40 P.Ct. Courrières.	
Analysis of the mixed coal—					
Moisture	3·40	7·83		4·65	
Ash	7·17	6·20		7·91	
Volatile matter (dry basis)	36·60	35·31		32·37	
Installation	A	B	C	B	C
Number of retorts per bench	16	16	20	16	20
Number of retorts at work	16	16	20	16	20
Nominal size of the retorts, tons	6·4	6·4	6·4	6·4	6·4
Internal volume of the retorts, c.ft.	194	194	194	194	194
Coal carbonized per retort per 24 hours, tons	6·49	9·17	9·72	8·02	8·67
Gas make per ton of coal charged (30 in., 60° Fahr. saturated), c.ft.	16,460	15,470	16,090	14,800	15,040
Calorific value of gas (30 in., 60° Fahr. saturated)	487·3	496·9	500·3	491·4	494·5
Therms per ton of coal charged	80·2	76·8	80·5	72·8	74·4
Therms per ton of dry ash-free coal	89·7	89·4	93·7	83·2	85·0
Average CO content of gas, p.ct.	13·54	14·33*	14·15*	12·15	12·50
Fuel consumption—					
Analysis of the coke—					
Moisture	2·28	5·05	7·37	5·72	6·67
Ash	8·63	12·09	11·59	12·17	11·93
Volatile matter	1·86	1·97	2·04	1·83	1·97
Fixed carbon	87·23	80·89	79·00	80·28	79·43
(The coke was not made on the plant under test.)					
Coke as charged on raw coal, p.ct.	14·53	15·14	9·55	17·22	11·62
Dry ash-free coke on coal charged, p.ct.	12·95	12·54	7·74	14·14	9·45
Percentage steaming on raw coal	10·10	5·41†	3·21†	5·86†	6·16†
Surplus steam from W.H.B. per 100 lbs. raw coal	14·50	24·20	..	25·55	..

* The Carlton-Saare mixture is recognized as giving a high CO content in straight carbonization.

† The small amount of steam used is due to the fact that a certain amount of water is sprayed into the coke box to quench the coke and avoid dust formation when the coke is discharged.

Every precaution was taken both before and during the tests to insure that the determinations should not be open to errors. The measuring devices, weighing machines, meters, calorimeters, &c., were checked. The samples of coal and coke taken independently by the contractors and by the acceptance department of the Paris Gas Company were analyzed in the La Villette test station. Analyses of the gas were made night and day by the chemical staff of the works under the direction of an engineer from the test plant. A Junkers recording calorimeter gave instantaneous indications of the calorific value of the gas made.

The results quoted for installation A were those obtained by the contractors when a high temperature, which we lowered appreciably at the end of the tests, was maintained in the setting. On the other hand, the results shown for installations B and C may be considered as representative of normal operation.

Furthermore, the tests on installation A were carried out in spring, but those of installations B and C in winter. It is necessary to take these special conditions into account when the results for the different settings are compared. The duration of each test was one week.

It will be noted that during the tests carbonization was carried out so as to produce a gas having a carbon monoxide content below 15 p.ct. and a calorific value of 492 B.Th.U./c.ft. to enable benzole, to the extent of some 55 grammes per 100 c.ft. of gas to be extracted.

If we had desired to produce a gas of calorific value equal to 470 B.Th.U./c.ft without any limitation as to the carbon monoxide content, so that the results might be comparable with those quoted by contractors in other countries, it would have been easy, as experience has proved to us and as calculations confirm, to increase the make of gas per ton of raw coals, in the regenerative setting—for example, from 16,090 c.ft. to 18,475 c.ft. and the therm yield per ton of dry ash free coal from 93·5 to 100·8 by slightly increasing the steaming.

Examination of the figures in the table shows straight away the great importance of—

(1) The nature of the materials employed in the construction of the retorts and burners, and
(2) The nature of the coal carbonized on the operation of continuous vertical retorts.

1. Influence of the Nature of the Constructional Material of the Retorts on the Throughput of Coal and the Make of Gas.

The use of silica bricks in gas retorts in France dates back only a few years. Their superiority over firebricks as regards thermal conductivity has for a long time been disputed and is, moreover, difficult to prove. Cassan, the Chief Engineer of the Compagnie Générale de Construction de Fours, stated at the Ceramic Industries Congress of 1928

that, having studied with his colleagues Widemann and Jourdain all that had been published in England, Germany, and France on the conductivity of firebricks and silica bricks, and having carried out numerous tests and ventured many theories, he could only come to the conclusion that it is impossible to determine sufficiently accurately the difference between the conductivity of silica bricks and firebricks at different temperatures.

We have not, so far, investigated this question in the refractories laboratory. It is, however, possible to give you some interesting practical information on the subject.

At the La Villette Works of the Paris Gas Company which contains 12 ranges of inclined chambers constructed between 1912 and 1922 in firebrick, we reconstructed one range (retorts and burners in silica bricks) in 1930. The experience of more than a year enables us to state that when the temperature in the combustion flues in this setting—the carbonizing time of which (24 hours) could not be altered—was maintained at least 100° C. lower than that prevailing in the firebrick settings, we obtained more perfect carbonization in the reconstructed setting than in the others.

We therefore consider it proved that the conductivity of silica bricks is greater than that of firebricks at normal carbonizing temperatures.

Furthermore, the greater hot crushing strength of silica

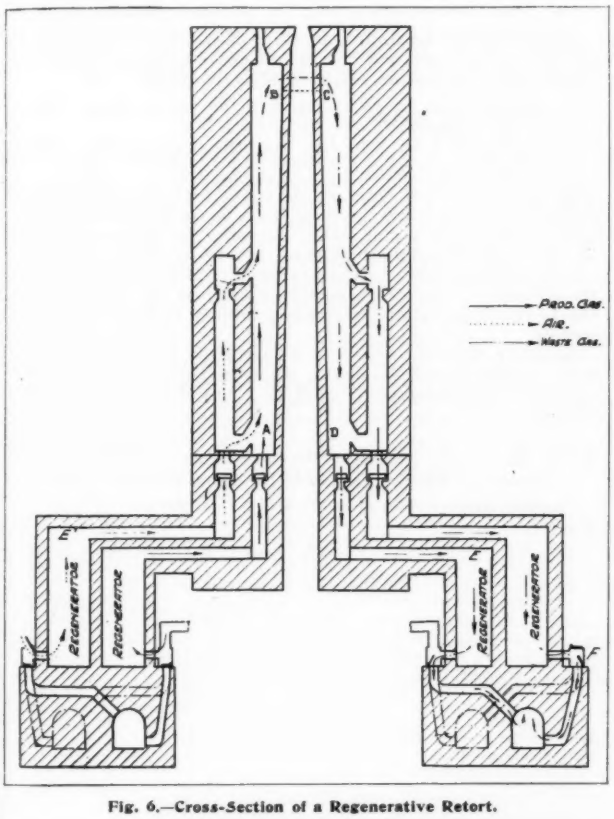


Fig. 6.—Cross-Section of a Regenerative Retort.
(Installation C.)

bricks enables at the same time the thickness of the retort walls to be reduced and temperatures of 1350° to 1400° C. to be maintained without danger in the combustion flues.

Actually, comparison of the results obtained in the A and B settings at Clichy shows that the replacement of firebricks by silica bricks in continuous vertical retorts of the same type enabled the throughput of a given mixture of coals to be increased from 6·5 to 9·2 tons per retort per day. The increase in the make of gas per retort per day was thus 40 p.ct.

2. Influence of the Nature of the Coal on the Throughput of Coal and the Make of Gas.

In intermittent retorts in which the carbonizing time is generally a fixed one, it is generally noticeable that one coal carbonizes more readily than another or needs less heat for carbonization than another.

I have myself been able to confirm, by tests carried out on horizontal retorts normally carbonizing in 4 hours, that, with equal temperatures and equal charges, a coal such as Saare coal will be carbonized as completely in 3 hours 45 minutes as will a high volatile French or English coal in 4 hours 10 minutes. In continuous retorts, the influence of the nature of the coal is even greater.

The tests at Clichy have, in effect, shown us that at a given temperature, in a particular retort, it is possible in practice to carbonize day in, day out, 9·2 tons of Saare and Yorkshire coals, whereas 8·1 tons can scarcely be exceeded with a mixture containing 40 p.ct. of Courrières coal. If the proportion of this latter coal is increased to 50 to 60 p.ct., it is necessary to reduce the throughput of

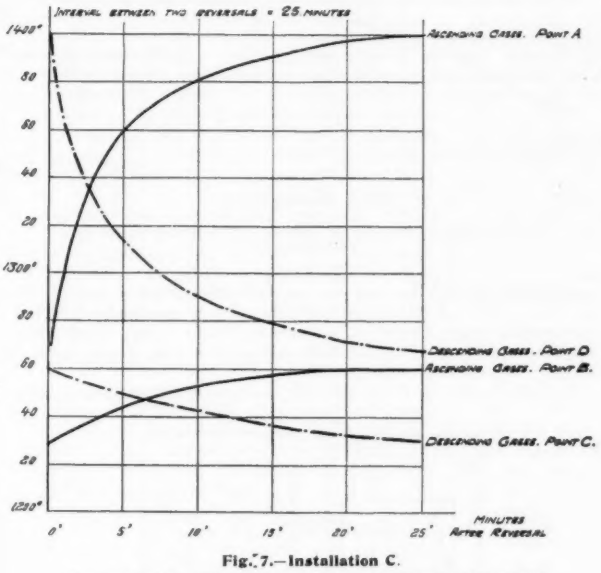


Fig. 7.—Installation C.
Curves showing temperature variations at various points in the combustion flues of a regenerative retort between two reversals.

coal to a figure very near to that of the nominal throughput of the retorts (6·4 to 6·9 tons).

This possibility of varying within wide limits the throughput of coal which the retorts can handle at a given temperature may be made use of by employing during periods of peak loads those coals which work easily, thereby decreasing the operating difficulties resulting from seasonal variations in the demand for gas. If, in addition, the carbonizing temperature and the amount of steam admitted are altered, variations additional to those dependent on the nature of the coal may be introduced and this enables the output of gas from a continuous vertical retort to be varied over a ratio of 1:2.

It is thus evident that the capacities ($4\frac{1}{2}$, $6\frac{1}{2}$, or 9 tons) quoted by contractors for continuous vertical retorts should

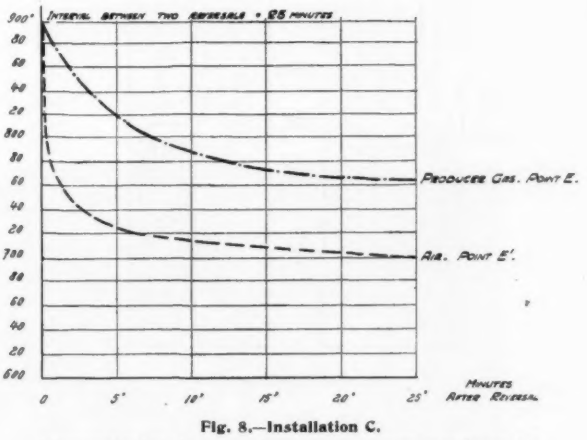


Fig. 8.—Installation C.
Curves showing air and producer gas temperatures at the outlet of the regenerators between two reversals.

only be regarded as indicative. It would doubtless be more advisable and at any rate more precise to rate the retorts in terms of their geometrical volume.

3. Production of Steam in Waste-Heat Boilers.

Steam Consumption for Steaming.

We have seen above that the waste gas leaves the regenerators of installation C at an average temperature of

155° C. and is discharged direct to the chimney. In the case of installation B, the waste gas which leaves the recuperators at a temperature of about 560° C. passes through a superheater and then to a waste-heat boiler prior to being exhausted, at an average temperature of 210° C., by the fan which passes it to the chimney.

In the latter type of setting, the production of steam at

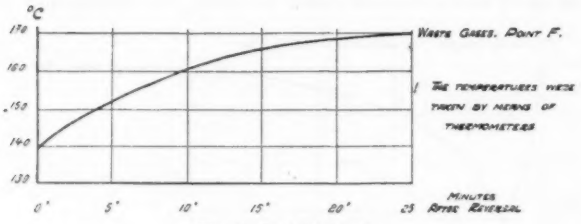


Fig. 9.—Installation C.

Temperature of the waste gas leaving the regenerators between two reversals.

a pressure of 115 lbs. per sq. in. and superheated to 375° C. is of the order of 30 lbs. per 100 lbs. of coal carbonized. This somewhat high figure is, however, much lower than that regularly obtained in British installations of downwardly-heated Woodall-Duckham retorts.

As you know, in these retorts the producer gas, generally

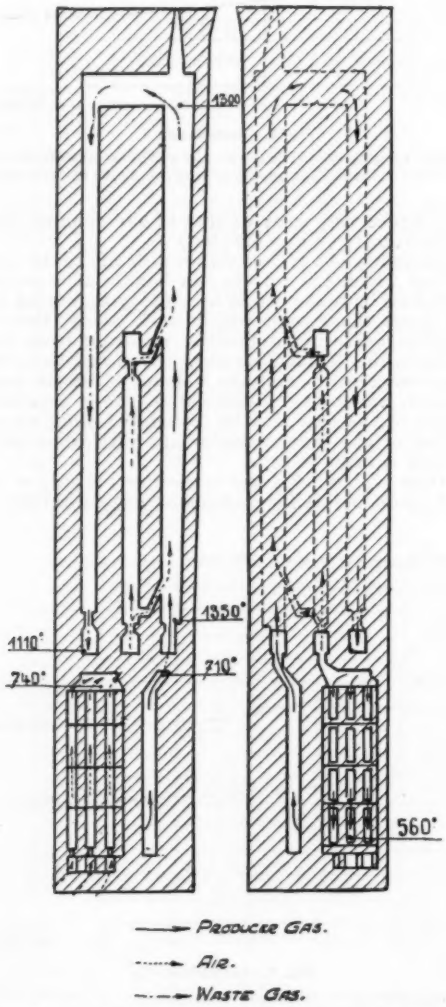


Fig. 10.—Cross-Section of a Recuperative Retort.
(Installation B.)

made in a battery of Siemens producers situated parallel to the setting, arrives directly at the burners which are at the top of the retorts and comes in contact with secondary air which has been preheated merely by passage through the middle wall of the setting. The recovery of the heat contained in the waste gas, which leaves the setting at a temperature higher than 900° C., is effected entirely in the waste-heat boilers which commonly attain a production of 50 lbs. of steam per 100 lbs. of coal carbonized.

From the above figures, it is naturally necessary to subtract the quantity of steam admitted to the retorts to arrive at the quantity of surplus steam. It is evident that the constructors can, actually, offer to their clients Woodall-Duckham continuous vertical retorts with widely differing characteristics as regards steam output.

I have no intention here of going into the question of the advantages and disadvantages of recovering, in the form of steam, part of the heat contained in the waste gas. I regard this as a question of practice rather than theory. In brief, what would be the use of slightly increasing the thermal efficiency of a setting by producing more steam than can be used, and, on the other hand, is it likely that an installation needing an external boiler plant could be justified when a slight modification to the setting would enable all the steam necessary for its operation to be produced in a waste-heat boiler?

In the special case of the Clichy Works, a part of the surplus steam from Nos. 1 and 2 retort houses will be used for steaming the retorts of the No. 3 house. It is, moreover, possible to send the steam from the waste-heat boilers, just as can be done with Marischka producers, through back-pressure turbines and to use, for steaming the retorts, only the exhaust steam.

4. Fuel Consumption per lb. of Coal Carbonized.

According to the figures in table No. 1 the consumption of dry ash-free coke per 100 lbs. of coal varies as follows at Clichy with the nature of the coal carbonized:

From 12·54 to 14·14 lbs. for the recuperative silica setting, and

From 7·74 to 9·46 lbs. for the regenerative silica setting.

We thought it of interest to convert these figures into B.Th.U., and to compare them with those obtained by the London Gas Light and Coke Company on an installation of 32 8-ton Woodall-Duckham retorts at Bow Common, taking into account, on the one hand, the heat conveyed to the retorts by the steam admitted and, on the other hand, the heat contained in the steam produced in the waste-heat boilers.

In order that the effect of varying producer efficiencies may be eliminated, we have given in the following table only the net consumption of B.Th.U. in the settings themselves.

Table II.—*B.Th.U. Consumed in the Setting per Pound of Coal Carbonized with Due Regard to the Steam Used for Steaming and the Steam Produced in the Waste-Heat Boiler.*

—	Installation A.	Installation B.		Installation C.		British Woodall-Duckham Installation
		Test 1.	Test 2.	Test 1.	Test 2.	
B.Th.U. contained in the producer gas at inlet to setting	1480	1440	1620	890	1085	1440
B.Th.U. contained in the steam used for steaming .	140	75	80	45	85	130
Total	1620	1515	1700	935	1170	1570
Deduct B.Th.U. contained in the steam produced. (115 lbs./sq. in. superheated to 375° C.)	340	410	435	..	..	690
B Th.U. consumed in the setting	1280	1105	1265	935	1170	880

The difference between these figures and those given by Euchène in his well-known paper to the 1900 Congress of the Société Technique (2340-2700 B.Th.U. per lb. of coal carbonized) indicates the progress realized in gas engineering in a period of thirty years. It is, furthermore, of interest to compare these figures with the laboratory results obtained by various investigators and especially by the German physicist Terres for the heat of decomposition of gas-making coals of different types. The work of Terres confirms the conclusion of Euchène, and shows that the heat of decomposition of coal—*i.e.*, the algebraic sum of the heat liberated by the exothermic reactions and absorbed by the endothermic reactions which occur during carbonization—is, depending on the origin of the coal and the carbonizing temperature sometimes positive, sometimes negative, but is always small—namely, of the order of 90-180 B.Th.U. per lb. of coal. However, to this heat of decomposition must be added:

The heat corresponding to the work performed by the evolved gas against the atmosphere.

The heat lost due to the fact that the heat capacity

of the carbonization products is greater than that of the coal.

The sensible heat carried away by the coke, gas, liquor, tar, and waste gas; and, finally,

The heat lost to atmosphere by radiation conduction and convection.

From a critical examination of these various losses and of the heat consumption figures given in the above table, the conclusion is drawn that if the possibility of a revolutionary and unlikely alteration in carbonizing practice is ruled out, it is useless to expect any appreciable reduction in the heat required for the carbonization of coal by modern retorts in gas-works.

III. Special Features of Regenerative Vertical Retorts.

From the figures given in the above tables, you have already been able to draw the conclusion that the regenerative setting C has the following advantages over the recuperative setting B:

(1) Increased yield of therms per ton of coal.
(2) Greater throughput of coal per retort per 24 hours.
(3) Lower fuel consumption for carbonization even if account be taken of the heat content of the surplus steam obtainable with recuperative settings.

Are there any others?

Some months of operation enable us to reply in the affirmative.

In brief, the regenerative setting is—

More easy to control;
More uniform as regards temperatures; and
More uniform in operation

than the recuperative setting.

The fact that the waste gas has a natural tendency to pass in greater volume through a burner, which had a tendency to overheating during the previous cycle, creates a kind of automatic control which in practice has shown itself to be very helpful.

Finally, the simplicity of the construction of the settings of the C installation, which results in great strength, leads us to hold high hopes as to their life.

These facts are not to be taken as indicating that regenerative continuous vertical retorts should forthwith supersede recuperative continuous vertical retorts. Each type has its advantages. We are, moreover, pleased to admit that, in all the tests at Clichy, the results, as we hoped they would, greatly exceeded the guarantees demanded of the contractors.

THE NEWS continued.

Gas Supply in Singapore.

The amount of gas manufactured at the Municipal Gas-Works at Singapore was 321,286,000 c.ft., against 370,992,000 c.ft. made during 1930, a reduction of 13·39 p.ct. Of this quantity 84,602,000 c.ft. was water gas, equal to 26·0 p.ct. of the make. The calorific value of the gas supplied is 500 B.Th.U. per c.ft. The cost of manufacture for 1931, including interest, sinking fund and renewals was $1·8831, against $1·88 per 1000 c.ft. in 1930. An increase of $0·0031.

The amount of gas used for public lighting was 145,193,074 c.ft., equal to 45·1 p.ct. of the output. During the year 164 new lamps were erected, and 2 lamps were cut off. The total number of lamps on the district is 3695, of which 444 are fitted with clock controllers for automatic lighting.

The amount of gas sold to private consumers was 147,394,137 c.ft., against 176,425,590 c.ft. for 1930, a decrease of 16·455 p.ct. The unaccounted-for gas was equal to 6·6 p.ct. of the make against 9·8 p.ct. for 1930. A total of 14,181 yards of mains were laid during the year, while 3064 yards of mains were replaced by pipes of a larger diameter.

The gross profit made was $5911.58 against $5079.94 in 1930, and the net profit from fitting was $5782.13. The revenue from hired appliances was $42,951.98 against $43,455.20 in 1930, a decrease of $503.22. The gross profit made by the Department, allowing for public lighting at cost was $235,825.63, and after deducting interest on loan, sinking fund, and renewal charges, there was a net profit of $86,074.51. Of this amount $27,287.73 was expended on additions of a capital nature to mains, &c., leaving a credit balance of $58,786.78. The net profit for 1930 was $103,186.34.

Creosoting of Railway Sleepers.

New Plant at L.M.S. Works.

One thousand railway sleepers a day is the output of the L.M.S. Railway's creosote works at Beeston, Nottingham, where new plant for more efficient and economical working has just been installed under a modernization scheme.

The output of the works is 365,000 finished sleepers per annum, and the plant consumes a million gallons of creosote a year. From February to September, during which period intensive track relaying is in progress on various parts of the L.M.S. system, over 10,000 sleepers are dispatched from the works each week, in addition to large quantities of other creosoted timber.

The new plant includes two large creosoting cylinders, each holding 450 sleepers, with a length of 79 ft. and an internal diameter of 6½ ft. The cylinders are fitted with high-capacity steam ejectors, and pressure is obtained from electrically-driven pumps capable of attaining 200 lbs. per sq. in. Recording apparatus indicates the temperature, pressure, and volume of creosote during the process.

MEMBERS OF THE IRISH ASSOCIATION OF GAS MANAGERS AND FRIENDS DURING THE EXCURSION TO HOWTH ON AUG. 17.

A TECHNICAL SIGNPOST : TO THE "JOURNAL" :

Vol. 198, April-June, 1932

Considerable interest is being taken in the possibilities of using town gas for motor transport. In Paris, where a considerable amount of experimental work has been carried out during the last few years, a number of heavy vehicles are now being run on compressed town gas, while in this country a joint investigation is being carried out by the Birmingham Gas Department, the Gas Light and Coke Company, and the Tottenham Gas Company. In a recent paper (p. 715) C. M. Walter has discussed the experimental work at Birmingham, where comparative tests on gas and petrol were made on two internal combustion (petrol) engines. The results of these tests may be briefly summarized as follows:

(1) The thermal efficiency of high-speed internal combustion engines, when supercharged, is greater with town gas than with petrol. The thermal efficiency can be further increased by raising the compression ratio.
(2) The maximum power with gas alone is lower than with petrol.
(3) Gas is more responsive to supercharging, the power output being increased to a greater extent.
(4) Carburetting the gas with benzene appreciably improves the performance.

In regard to the compression of the gas it is stated that approximately 9 H.P. is required to compress 1000 c.ft. to 3000 lbs. per sq. in. The cost of compression, including capital charges of a plant capable of handling 350 c.ft. per min., is given as 7·45d. per 1000 c.ft. when electrically driven, and 6·11d. when steam operated. Further, on the basis that 265 c.ft. of 475 B.Th.U. gas is equivalent to one gallon of petrol, the total cost of 1000 c.ft. of compressed gas at 8d. per therm is 3s. 9½d., and the equivalent petrol at 1s. 4d. per gallon is 5s.—a reasonable margin in favour of gas. This does not include the cost of cylinders, concerning which no information is afforded.

The problem of storing sufficient gas without increasing excessively the weight of the vehicle has been simplified by the use of special nickel chrome molybdenum steels, and in particular the "Vibrac" steel manufactured by Vickers-Armstrongs, Ltd. The cylinders in question contain 1·76 c.ft. at N.T.P., and have a wall thickness of only 0·19 to 0·22 in. The steel has a yield point of 59·5 tons per sq. in., and a breaking stress of 67·9 tons per sq. in. At Tottenham (p. 499) a lorry has been fitted with six of the above cylinders each 71¼ in. long and 7⅝ in. diameter, the total capacity at 2000 lbs. per sq. in. being equivalent to about 8 gallons of petrol—sufficient for an average day's work. Practically no alteration of the engine is required, the gas being supplied via a reducing valve to an air-gas mixing chamber, which is so arranged that the engine can be quickly changed back to petrol when desired. Satisfactory results are being obtained; and while the general use of compressed gas for passenger and other vehicles is not permissible under existing regulations, it does not seem unlikely that some revision may be obtainable. There would appear to be considerable promise for the utilization of gas, and further work may indicate methods of greater economy in running. In Germany, the use of compressed methane is being examined, particularly in regard to rail transport, and it has been suggested that Diesel-electric locomotives may be replaced by gas-electric engines.

On the Continent the problems of rendering town gas non-toxic, and of giving it a strong odour, continue to be investigated. In a recent patent (B.P. 361,476) (p. 201) Kemmer proposes to pass a mixture of gas and steam over a series of catalysts to remove the major portion of the carbon monoxide, the remainder being removed by hydrogenation. In previous patents, oxidation of carbon monoxide to carbon dioxide by bacteria has been proposed. In regard to the odorization of gas, various reagents have been tried (p. 208). The Standard Oil Company, for example, has used a mixture of mercaptans, sulphides, and disulphides, containing 4·5 p.ct. of combined sulphur. Another reagent used for this purpose and marketed under the name of Detektol K. is prepared by the action of sulphuric acid on a cracked motor spirit fraction. A mixture of this preparation and unsaturated hydrocarbons is now being added to the gas by a number of works in Poland. It will be recalled that experiments were carried out in America a short time ago when organic sulphur compounds were added to the gas and the effects upon the consumers noted. The experiment did not appear to have been too successful, and no further reports have been made in this respect.

The subject of the power requirements of gas-works has been dealt with by F. M. Birks in a paper (p. 701) on the "Co-ordination of Power Relative to Gas-Works." The general principles which determine the choice of steam, gas, or electricity for the power requirements of a gas-works are considered, and the particular uses of each are outlined. Only brief mention is made of gas engines, which are stated to be advantageous where bye-product steam is not available at low cost, and in some cases where electricity from an outside source forms the only alternative. More detailed consideration is then given to the various methods of power generation and utilization adopted at some of the works of the Gas Light and Coke Company.

At the Beckton Works the power plant comprises eleven waste-heat boilers in retort houses and four water-tube boilers, all working at 160 lbs. per sq. in. pressure and superheated to 300° C., together with nine waste-heat boilers in the water gas plant. It is stated that during the first half-year of 1931, 78 p.ct. of the total steam required at this Station was raised by waste heat. While superheated steam is advisable for turbines, &c., it is unsuitable for the older reciprocating engines, and de-superheaters—one of which is described in detail—are installed at convenient points. Where possible, exhaust steam is utilized; for example, the turbines of the water gas plant exhaust to feed water heaters, direct and indirect. Turbine exhaust steam is also utilized for the benzole extraction plant.

At the Brentford Works, which are being extended, a practically new system is being installed. This comprises four waste-heat boilers in the retort houses and two in the water gas plant. In addition, there are also three water-tube boilers, all working at a pressure of 160 lbs. per sq. in., while the water gas generators are to be provided with annular boilers working at a low pressure. The difference between supply and demand is taken up by a steam accumulator of a capacity of 12,000 lbs. Steam supplied to the chamber ovens is obtained from the exhaust of the induced draught fans of the waste-heat boilers, which are arranged to exhaust at 20 lbs. per sq. in. pressure. In view of the fact that the chamber ovens are fitted with efficient regenerators there is a relatively small output of waste-heat steam. Hence, special attention has been given to the economy of steam, and with the exception of the turbo gas boosters, all exhaust steam is utilized.

At the Chemical Works very efficient steam generation is obtained by the use of breeze in water-tube boilers which are fitted with a special furnace designed at these works. Liquor distillation is effected by exhaust steam from the back-pressure turbines used for direct current generation.

In regard to the cost of steam generation, this is given as 5·8d. per ton (exclusive of capital charges) for the Bow Common Works, the steam being mainly generated by waste heat. This figure may be compared with that of 1s. 9d. per ton for the cost of steam generation from breeze in the water-tube boilers at the Chemical Works.

Carbonization.

An outstanding event of the past quarter has been the starting up of the new coke oven plant at the Beckton Works of the Gas Light and Coke Company (p. 313). The installation consists of 60 Koppers twin-flue combination ovens which may be heated by either coal gas or producer gas. The ovens, which are 41 ft. 10 in. long, 14 ft. 1½ in. high, and 17¾ in. wide, carbonize a charge of 16 tons in 19 hours, the total capacity of the plant being 1200 tons per day. The latest improvements, such as self-sealing doors, brick-lined gas offtakes, &c., are embodied. The flues and chambers are constructed of 95 p.ct. silica material, while uniform heating is secured by the arrangement of hairpin flues and re-circulation of waste gas in the combustion flues. The coal, which is crushed in two stages until 80 p.ct. passes ⅛-in. mesh, is charged through three ports in the roof of the oven, the evolution of smoke and dust being minimized by the provision of steam ejectors in the gas offtakes. The charging operation is effected in 2½ minutes, and the discharging in 4 minutes. The coke is quenched in a coke car under a quenching tower and then discharged on to a bench, where it is allowed to drain and cool for about 40 minutes. By confining the quenching time to ¼-1½ minutes, it is stated that the aver-

age moisture can be maintained at 2 p.ct. with a maximum of 12 p.ct. in the sizes from 1½ in. to ¾ in. The ovens are heated by a battery of nine Koppers mechanical producers, 8½ ft. in diameter, and each capable of gasifying 21 tons of coke breeze per day. Of this fuel, 100 p.ct. passes 1¼-in. mesh and 30 p.ct. ⅜-in. mesh, the inert content being 30 p.ct. Segregation of the fuel is prevented and a uniform fuel bed maintained by the provision of a mechanical distributing device. The producer gas is washed and cooled to about 30° C., the dust content being reduced to 2-3 grains per 100 c.ft.

Carbonization in modern coke ovens introduces a new aspect of the question of waste-heat recovery. Owing to the provision of efficient reversible regenerators, the waste gases leave at about 250° C., and hence a low fuel consumption (about 10 p.ct.) is secured. There is, however, no heat available for the generation of steam, and Birks (p. 710) has made an interesting comparison of the fuel cost of the above system with that of horizontal retorts with waste-heat recovery—viz.:

Net Cost of Fuel in Pence per Ton of Coal.

Horizontal Retorts.	d.	Coke Ovens.	d.
Coke— 321 lbs. at 24s per ton . .	41·2	Coke— 177 lbs. at 24s. per ton . .	22·7
Breeze— 15 lbs. at 6s. per ton . .	0·5	Breeze— 69 lbs. at 6s. per ton . .	2·2
1000 lbs. of steam are raised, *less* 120 lbs. used on fans = 880 lbs. available for use.		Breeze required to generate 880 lbs. of steam in direct fired boilers = 176 lbs. at 6s. per ton	5·7
	41·7		30·6

These figures show an appreciable saving in the net cost of fuel in the case of coke ovens, despite the fact that it is necessary to generate the producer gas in outside producers in order that it may be cleaned before being admitted to the burners. The possibilities of further heat economy being effected by the generation of steam from the sensible heat of the coke are mentioned by the same author, who states that, in view of the low cost of steam raising from breeze and the necessity for direct fired boilers as a stand-by, it is doubtful whether the high capital cost of the plant required for this purpose is justifiable. With the production of a superior breeze and its extended use as producer fuel, its value should tend to rise, in which case the economy of sensible heat recovery from coke may become more attractive than it is at the present time.

A comprehensive review of ten years' carbonization in continuous vertical retorts at Carlisle has been given by J. E. Blundell to the Institution of Gas Engineers (p. 733). During this period the therms per ton increased from 53·6 to 87·47, the coke and breeze falling from 12·2 cwt. to 8·8 cwt., while the tar increased from 10·49 to 16·20 gallons per ton. The calorific value of the gas was maintained at approximately 450 B.Th.U. per c.ft. throughout. The coals carbonized were from the Cumberland coalfield, and the analysis of coals now in use showed about 6 p.ct. of inert matter and 30-33 p.ct. of volatile matter. The very considerable improvement in yields is presumably attributable to more efficient working and an improvement in the quality of the coal. The influence of the price of coke upon the cost of manufacturing gas of different calorific values was emphasized, and the relationship illustrated by a chart. From an examination of the chart it will be seen that if the price of coal is 20s. per ton and the price of coke 23s. per ton, the cost of manufacture is roughly independent of the calorific value of the gas produced. When the price of coke exceeds 23s. per ton, the cost of gas increases as the calorific value is reduced, while lower coke prices are attended by variations in the opposite direction.

Mention was also made by Blundell of the cracking of gas oil in vertical retorts, but large-scale tests had indicated that with the oil prices now ruling no advantage was to be gained in regard to the cost per therm of gas made. Recent work carried out in Germany (p. 513), however, indicates that appreciable economy may be obtained by the injection of tar together with steam into the hot coke of chamber ovens, &c., towards the end of the carbonizing period. According to A. Steding, two methods are applicable. Either atomized tar with steam is sprayed into the space above the coke at the end of carbonization, or tar is sprayed above the coke, the steam being introduced below. The results obtained are particularly interesting:

—	Straight Carbonization.	Steaming.	Tar Above and Steam Below.
Gas, therms per ton . . .	66·5	88·8	101·2
Tar, p.ct. on coal	4·0	4·0	*Nil*
C.V. of mixed gas. . . .	545·0	450·0	450·0
Coke, p.ct. on coal . . .	71·45	68·40	66·7
Fuel, p.ct.	13·6	15·06	15·06

The results indicate that the 4 p.ct. of tar (8·5 gallons) has been converted into gas equivalent to 22·3 therms, which would appear a profitable undertaking. There is the additional advantage of increased output from the plant without increased labour and other charges.

Two new installations of Woodall-Duckham vertical retorts have been put into operation. At Sittingbourne (p. 204) the retorts have a major axis of 44 in., a size specially adapted for small works. The setting comprises six independent retorts, any one of which can be let down independently of the others. Combustion of the producer gas is now arranged to take place upwards instead of downwards, as formerly, allowing more accurate control and zoning of the heats. This latter aspect is of special importance as local swelling coals are to be carbonized. The bottom castings are so constructed that the lower part of the retort is conveniently accessible for spraying, &c., to reduce the slagging effect of the ash of the coal. The other installation, at Shrewsbury (p. 567), comprises twelve 62-in. retorts, and here also upward heating is practised. The vacuum in the retorts is controlled by an "Arca" regulator, while it is possible to increase the output of the waste-heat boiler by an auxiliary supply of producer gas.

Producers, Complete Gasification, &c.

The problem of the utilization of breeze in producers has been the subject of much investigation, and in general it has been found possible to gasify breeze from which the finer material has been removed. Comparisons of results suffer from the fact that there is no definition of the term "breeze." Generally speaking, the smaller the size of the fuel the lower is the throughput of the producer, a factor which must be taken into consideration when comparing the relative values of coke and breeze as fuel.

According to A. Kolar (p. 439), a throughput of 14·3 tons per day was obtained in a Koller mechanical producer 8 ft. 6 in. in diameter, using a mixture of coke and breeze, of which 36 p.ct. remained between 0·6 in. and 0·4 in., and 51 p.ct. between 0·4 in. and 0·04 in. This is contrasted with a throughput of 32 tons per day in a Marischka producer when the breeze was mixed in the proportion of 75 p.ct. coke (⅞ in.-1 in.) and 25 p.ct. breeze. Figures are also given showing the reduction in throughput of a Koppers mechanical producer as the size of the fuel is decreased.

Recently, experiments have been carried out at the Fuel Research Station (p. 744), in which breeze was gasified in a water gas generator converted into a producer, the air flow being alternately up and down for a period of ten minutes. The generator is 4½ ft. in diameter and 11½ ft. high, and the output obtained was about 500,000 c.ft. of producer gas per day. The fuel gasified was ordinary horizontal breeze from the South Metropolitan Gas Company, having the following screen analysis:

On ½ in.	23·7 p ct.
½—¼ in.	21·7 ,,
¼—⅛ in.	24·2 ,,
Passing ⅛ in.	30·4 ,,

A medium rate of gasification (16 lbs. of fuel per sq. ft. of grate area per hour) was maintained, the fuel depth being 4 ft., while a clear space of 6½ ft. was allowed between the gas offtake and the fuel bed. The differential pressure was stated to be 9 in., while clinkering was carried out once in 24 hours. A yield of 65 c.ft. of gas per lb. of breeze was obtained, the calorific value being about 110 B.Th.U. per c.ft. These results would appear distinctly promising, and particularly as it was stated that no undue difficulty was experienced in regard to the entrainment of dust from the fuel bed.

According to Blundell (p. 737), it is possible to gasify breeze under ¾ in., of which 30 p.ct. passes ¼ in., in a step-grate producer using forced draught. The gasification of the larger size breeze in internal producers, equipped with forced draught generated by steam injectors, has also been shown to be a practical proposition.

The complete gasification of coal and the consequent production of a low-grade gas is now only being practised in relatively few cases. R. H. Duxbury (p. 325) has recently summarized the results obtained by gasification in the Tully type of plant at South Bank, where a gas of 400 B.Th.U. per c.ft. is distributed. This is produced by mixing about 25 p.ct. of straight horizontal gas with gas from the Tully plant, the calorific value of which is about 330 B.Th.U. per c.ft. An outstanding feature of the process is the relatively low inert content of the gas, the total inerts amounting to only 9·5 p.ct. The yield from the Tully plant itself is about 170 therms per ton, while from both plants a yield of 100 therms per ton of coal is obtained, together with 10·5 gallons of tar and 4·16 cwt. of coke made for sale. Labour costs are low since the Tully plant is operated

mechanically, less than one man per shift being required. One of the main arguments advanced in favour of complete gasification is the obviation of the sale of coke, whereas the trend of current thought lies in the direction of concentrating upon the production of a high-grade coke, as the coke market shows promise of becoming of greater importance to the Industry. On the other hand, as a means of disposing of high ash coal which is not amenable to cleaning processes, complete gasification may well be given consideration, particularly in the case of undertakings in the neighbourhood of coal fields. An interesting proposal is contained in a recent patent (p. 582) (B.P. 366,782) of Humphreys & Glasgow for the complete gasification of coal. In order to economize in the use of fuel, some of the hot gas leaving the carbonizing chamber is re-circulated by means of a steam injector through the fuel bed, and its sensible heat is thus partially utilized.

Low-Temperature Carbonization.

An account of the technical work which has been carried out in the development of the "L. & N." system of low-temperature carbonization in rotary retorts has been given by H. Nielsen (p. 270) in a paper to the Institution of Chemical Engineers. Preliminary work was first carried out on a small-scale plant (10 tons per day) at Barnsley, a larger unit of 140 tons per day being subsequently erected at Ashby-de-la-Zouch, which unit is still in operation. In this process, coal, dried by waste gas, is fed to an internally heated rotary retort via a coal feed valve which prevents access of air to the retort. The coal is distributed uniformly in seven internal tubes, which form the interior of the retort, and passes downwards to the lower end, from which it is removed through a discharge door electrically operated. The heating is effected by hot waste gases passing through the tubes counter-flow to the coal, the heating gas being generated by burning producer gas made from coal in an outside producer. The coke, after water quenching, is screened. It is stated that from coals with an ash content of 20 p.ct. a coke containing only 5 p.ct. of ash is produced, this being apparently effected by gravity separation of the ash in the quenching operation. The mixture of waste gas and low-temperature gas is passed through a cyclone, kept above the condensation point, and thence to a dust tower, in which the residual dust is removed by a spray of liquor. The gas then passes through condensers and a centrifugal fan, in which the greater part of the oil fog is deposited, and finally through another condenser and oil spray washer to complete the removal of the suspended oil. Part of the gas is then blown into the atmosphere, and the remainder returned to the combustion chamber and re-circulated for the purpose of temperature control. A yield of 12·6 cwt. of coke is obtained from a coal containing 10 p.ct. of ash, calculated on the dry basis, and the yield of oil on a similar basis appears to be of the order of 15 gallons per ton. The gas is not scrubbed for light oil, owing presumably to the large dilution with waste gas, and there is, of course, no gas yield. The over-all fuel consumption is given as about 10 p.ct. of the weight of the coal, while the operating cost is stated to be of the order of 4s. 6d. per ton of coal treated.

A description of the plant erected at the East Greenwich Works of the South Metropolitan Gas Company for the manufacture of "Coalite" is given (p. 775) in connection with the visit of the Institution of Gas Engineers to these works. The plant comprises five batteries of retorts, of a total capacity of 320 tons of coal per day. In each battery there are 36 retorts which are arranged in two rows. Each retort consists of a vertical iron casting, 9 ft. long, containing eleven carbonizing tubes, each 5¾ in. in diameter at the bottom and tapering to 4½ in. at the top, the capacity of each tube being approximately ½ cwt. The retorts are closed at the bottom by a hinged door, operated by a chain wheel outside the battery. Connection between the retort and the hydraulic main is made by means of a water seal in order to allow for the expansion of the retort. The retorts and combustion chambers are arranged alternately, there being 19 combustion chambers and 18 retorts on each side of the battery. The gas and air are burnt in an inner chamber, the heat from which is transmitted to the retorts through panel bricks. Thus there is no actual contact between the retorts and heating gases, and in this way local overheating of the castings is avoided. While low-temperature gas is now being used for the heating of the retorts, it is propose dtouse ultimately producer gas. The "Coalite" is discharged into sealed cooling chambers situated below the retorts, whence it is taken by a conveyor to a screening plant. To complete the cooling and to reduce dust trouble, the coke is sprayed with water on the conveyor. The plant is arranged so that the hot crude gas can be freed from tar in an electrostatic precipitator, and from ammonia in a direct ammonia recovery plant, but this part of the plant is at present by-passed. The gas is then passed through condensers and exhausters to a light oil recovery plant, in which the oil is scrubbed from the gas by means of gas oil. In regard to the process yields, the following figures are given per ton of dry coal:

"Coalite"	12¼–13 cwt.
Volatile matter	10–12 p.ct.
Moisture content	3 p.ct.
Ash content	6 p.ct.
Breeze	10–15 p.ct. of the total coke
Tar (dry)	18 gallons
Light oil	2·7–2·8 gallons
Gas	30–35 therms
Calorific value	900–930 B.Th.U. per c.ft

Refractory Materials.

A useful summary of current knowledge concerning the behaviour of refractory materials in vertical retorts has been given by A. T. Green (p. 446). In regard to silica work, particulars are included of the reversible and permanent expansion at different temperatures, and the need for careful control of the rate of heating up and letting down of settings is emphasized. It is considered that expansion spaces should be left as such and not filled in with combustible material, since this may not burn away before the major expansions occur. In some cases the erosion of the inner retort surfaces is attributable to slagging action which arises from the ash present in the coal, the various fluxing materials in the ash, iron compounds, alkalis, &c., passing into the pores of the refractory material. In the presence of steam, the iron compounds are present in the ferrous state, and their slagging action is thereby considerably increased. In one case which was investigated the greater part of the slagging material was found to be present at the bottom of the retort, and on analysis was found to contain over 50 p.ct. of alkalis. The percentage of fluxes in the slag was found to decrease on going up the retort, probably due to reduced temperature, and it is suggested that a relatively small temperature increase may appreciably increase the penetration of slag. In regard to jointing, it is considered essential that joints should be as thin as possible, and that special attention should be given to the cement used. A limited quantity of clay is considered advisable (7 to 10 p.ct.), but the use of artificial plasticizers is not recommended, as these may tend to burn out and reduce the adherence of the cement. Further, in view of the fact that erosion troubles are frequently confined to definite zones, it is suggested that different types of materials may with advantage be used for the different zones of a retort.

Purification.

As mentioned in the last review, the accumulation of stocks of spent oxide with the consequent fall in value is directing attention to alternative methods of treatment and disposal. An admirable survey of the work which has been carried out in Germany on the treatment of spent oxide has been given by H. Broche and his collaborators (p. 874). Briefly, the aim has been:

(1) To remove the sulphur from the oxide in a reasonably pure condition, when a relatively high price may be commanded.
(2) To return the extracted material, possibly after some activating treatment, to the purifiers, the process being continued until a fairly high concentration of "blue" is obtained, which compound may then be profitably extracted. The residue may again be returned for further use as a purifying material.

The extraction of the sulphur presents many difficulties; extraction by solvents results in a mixture of tar and sulphur from which the separation of pure sulphur is a difficult and costly matter. One method for the removal of tar is to wash the oxide with cold benzole, when the majority of the tar is dissolved but little of the sulphur. In regard to the extraction of the sulphur, treatment with carbon disulphide at 100° C. under pressure is considered to be the most suitable method. The residue is shown to be slightly lower in activity than the original oxide, but after activation by the addition of sodium carbonate or precipitated chalk the absorption of sulphur is equal to that of the original material. The addition of these activators is specially valuable in speeding up the rate of revivification, which is in some cases relatively slow with the extracted oxide. It is stated that purifiers have been working satisfactorily with the extracted oxide for the past twelve months. The necessity for co-operative working in the treatment of spent oxide is emphasized, and reports have recently been current that a large plant is to be erected in Germany to deal with spent oxide from a number of works.

Substantial deposits of bog ore are reported (p. 260) to have been found in Cornwall, and this material is stated to constitute a good purifying medium. Further details will be awaited with interest in view of the increased cost of the imported natural and artificial oxides.

The relative efficiencies of hurdle packed tower scrubbers and the Feld centrifugal washer have been analyzed by Weittenhiller (p. 378). Much greater throughput per

cubic foot of washing space is claimed for the latter, thus rendering possible a very considerable economy in ground space. In regard to the efficiency of ammonia recovery, a liquor of 12 oz. strength is obtained by two Feld washers in series, the ammonia leaving being 2 grains per 100 c.ft. With one scrubber, however, the liquor strength does not exceed 4½ oz. In the case of benzole extraction there is a slight advantage to be gained by the use of the Feld washer. The capital and working costs of the two types of washers are shown in the following table, from which it will be seen that there is an appreciable economy by the use of the Feld washer:

—	Static Scrubber.	Feld Washer.
Capacity, c.ft. per hour	700,000	900,000
Capital cost	£11,500	£7,500
Gross annual cost, including capital charges	£2,805	£1,350

Coke.

The potentialities of the coke market and the necessity of producing a clean, dry, well-graded material are becoming more generally appreciated, and an improvement in local coke sales has been reported from several quarters consequent upon the introduction of screening plants.

The possibilities of coke breeze as a fuel still require investigation, and there have been several reports regarding the successful use of this material in producers (notably of the Woodall-Duckham type) and in an external producer at the Fuel Research Station. A summary of some of the work which has been carried out on the Continent regarding the utilization of breeze has been given by Kolar (p. 439). At the Vienna Gas-Works, breeze (below ⅛ in.) is mixed with coal dust in the proportion of 85 to 15 and burned in Babcock & Wilcox boilers; an evaporation of 5·4 lbs. of steam (190 lbs. pressure superheated to 660° Fahr.) per lb. of fuel is obtained, the over-all thermal efficiency (including feed water heaters and superheaters) being 74·7 p.ct. The breeze contains 33·7 p.ct. over 0·2-in. size, and 36·5 p.ct. under 0·08-in. size. Following further improvements, it proved possible to burn the breeze without the addition of coal. Details are also given regarding the gasification of different sizes of breeze in a mechanical grate producer. Investigations have been made regarding the briquetting of breeze before gasification, but this has not been found to be an economical proposition.

In regard to the suitability of different types of coke as a domestic fuel, Blundell is of the opinion that vertical retort coke constitutes the most suitable type as it is easily ignitible, dry, and has a low ash content, the latter characteristic being, of course, dependent upon the coal carbonized (p. 733).

Tar.

A further paper on the subject of road tar has been given by W. E. Cone (p. 148). After briefly discussing the history of the development of roads and the use of tar for road-making purposes, consideration is given to the various ways in which tar is at present utilized in road surfacing operations. Apart from the necessity of employing tars which conform to standard specifications, there is a growing appreciation of the fact that the methods of application demand as much attention as, if not more than, the consistency of the tar itself. Some of the aspects involved have been considered in an earlier paper by the above author, and are noted in the previous review.

The problem of the corrosion of stills utilized for tar distillation has been investigated by the Chief Alkali Inspector (p. 818). In a previous report it was indicated that the corrosion can be definitely ascribed to the presence of ammonium chloride in the tar, and experimental work has been continued in order to determine some means of eliminating the corrosion. Of the three methods examined—viz., application of a protective coating to the steel; addition of inhibiting substances; and finally removal of the ammonium chloride prior to distillation, only the latter appears to give any promise of ultimate success. A Committee has now been set up to investigate this problem on a large scale.

The distribution of sulphur in the distillation fractions of crude tar has been examined by the Chief Alkali Inspector. In the case of a horizontal retort tar 59·7 p.ct. remains in the pitch, 27·7 p.ct. is present in the oil condensate, and 3·5 p.ct. in the aqueous condensate, while 9·1 p.ct. is evolved (as H_2S) in the gases. It is concluded that during the distillation of tars, tar oils, and crude benzoles, noxious gases are evolved throughout the whole distillation process, and that some method of dealing with these gases is necessary.

It may be of interest to note that several processes are now in operation for the recovery of acid and spirit from the acid tar produced by the acid washing of tars, &c. A recovery of 40 p.ct. of the acid and 2 p.ct. of the spirit has been obtained.

Ammonia.

Interesting statistics are given in the Annual Report of the Chief Alkali Inspector in regard to the manufacture of sulphate of ammonia (p. 818). During the past ten years the number of registered works decreased from 723 to 469, but the quantity of ammonia recovered remained stationary until 1930, indicating the tendency towards centralization of production. The quantity of ammonia products manufactured in gas-works in England and Wales, expressed as sulphate of ammonia, was:

1930 . . . . . 142,271 tons
1931 . . . . . 130,300 ,,

The report continues: "No method for the destruction of raw liquor hitherto evolved can be described as satisfactory. Not only are such methods wasteful, but they nearly all lead to increased atmospheric pollution." The Alkali Inspector is thus definitely of the opinion that, in general, it is preferable to continue to manufacture sulphate rather than to dispose of the liquor in various ways, despite the fact that a direct loss must in many cases be faced.

In a paper (p. 83) to the Midland Association of Managers of Sewage Disposal Works, A. Key deals with the problem of the disposal of ammoniacal and effluent liquor into sewage systems. By the addition of gas or effluent liquor to sewage in quantities usually from 0·4 to 0·5 p.ct. the oxygen absorption value of the latter is increased by about 4 parts per 100,000. Obviously, the rate of addition must be maintained constant in order to avoid excessive local concentration. Where a sulphate plant is worked intermittently difficulty arises, since a large volume of effluent has to be disposed of over a short period, and may give rise to an excessive increase in the oxygen absorption value of the sewage. Reference is made to the experimental work carried out at Coventry and Cheltenham on the ease of oxidation of crude ammoniacal liquor and effluent liquor in the sewage system. At Cheltenham, the effluent liquor added was equivalent to about 0·5 p.ct. of the volume of the sewage, and resulted in an increase in the oxygen absorption value from 3·76 to 10·55. After treatment in bacteria beds the figures were 1·14 and 1·60 respectively. Generally speaking, effluent liquor was more easily oxidized than crude gas liquor. The general inference from the paper is that both liquors may, with reasonable care, be disposed of via the sewage system without incurring any damage to the latter.

In regard to the practice of sulphate of ammonia manufacture, some interesting features were noted (p. 779) on the occasion of the Institution's visit to the Chemical Works of the South Metropolitan Gas Company. In addition to producing the ordinary sulphate of ammonia for agriculture, various refined grades are manufactured on a large scale for industrial purposes, such as the manufacture of dry batteries. The ammonia saturators, stated to be of special design, embody features which permit some control of the size of the crystal produced—a factor of importance. The plant is comprised of four units, each unit consisting of one saturator and two stills, and capable of producing about 20 tons of sulphate of ammonia per day. The stills are of the Carpenter type, from which the distillation elements can be removed without disturbing the outer shell. For distillation, a steam consumption of 30 lbs. per 100 lbs. of liquor distilled is necessary.

Storage.

The new 6 million c.ft. Klönne gasholder (p. 440) erected at Syracuse, N.Y., is the largest of its kind in the world, there being some 45 holders of this design now in use with a total capacity of 50 million c.ft. In the above holder a modification has been introduced in the form of the Stacey-Klönne sealing ring. This consists of an expansible sheet steel ring suspended from the framework of the piston, and to this is attached a gas-resistant packing material consisting of vulcanized cotton fabric, faced with leather on the lower side. This is held against the holder shell and lubricated by a special grease, the lower edge of the sealing ring being attached to the outer edge of the piston structure by a strip of sheet lead, fabric covered, forming a gas-tight connection which allows movement of the sealing ring. The holder shell is 188 ft. in diameter, 251 ft. high, and is constructed of ⅜-in. steel plates strengthened by 36 vertical I beams and by horizontal angle rings. The piston is a segment of a sphere designed as a self-supporting arch.

Practical details of the construction of a 4·4 million holder at Copenhagen are given by J. W. Hansen (p. 139). In the erection of this holder special attention was given to the earth pressure upon the walls of the holder tank, and an apparatus was devised by means of which this pressure could be measured at different levels. Curves are given showing the variation in pressure with the distance below ground.

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Irish Association of Gas Managers

FORTIETH ANNUAL GENERAL MEETING

This year Dublin was fixed for the annual meeting of the Association, which was held in Jury's Hotel on Tuesday, Aug. 16, under the Presidency of Mr. L. G. YOUNG, of Carlow. Mr. R. E. Gibson, of Liverpool, the President of the Institution of Gas Engineers, and Mr. J. W. McLusky, of Glasgow, were among the visitors. Mr. E. J. Fottrell, Joint Manager, attended on behalf of the National Gas Council of Great Britain and Ireland; but unfortunately Mr. J. C. Walker was prevented by indisposition from representing the British Commercial Gas Association. Among the visitors from London was Alderman F. W. Church, F.C.I.S. The business sessions were well attended, and highly successful in the matter of the "fare" provided; while a thoroughly enjoyable evening was spent, when the members and lady friends were the guests of the Chairman and Directors of the Carlow Gas Company at dinner.

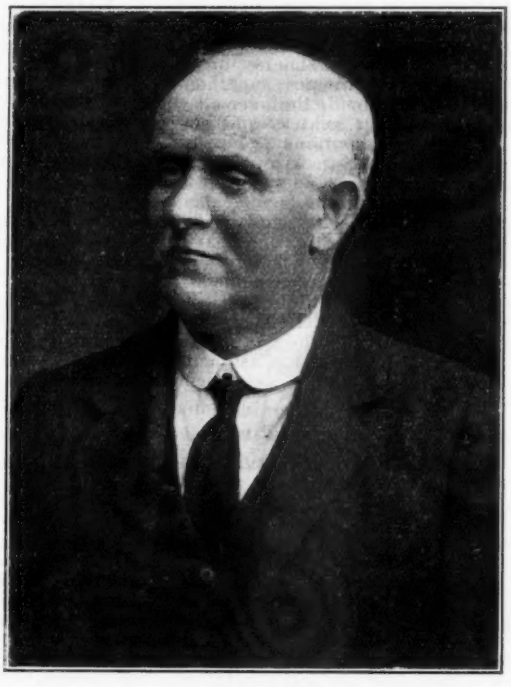
THE LORD MAYOR'S WELCOME.

The LORD MAYOR OF DUBLIN (Alderman Byrne, T.D.) opened the business proceedings in the morning by extending to the Association, on behalf of the citizens generally, a hearty welcome. He expressed the hope that, as a result of the conference, many benefits would arise for the Industry which the members represented—an Industry which was probably one of the oldest in the country, and, in spite of the competition existing in the Free State, one of the most successful. ["Hear, hear."] A few years ago pessimists thought that the Gas Industry was in danger; but, at any rate so far as Dublin was concerned, one of the best managed and most successful institutions of the city was the Gas Company, who had abundantly proved that they had no fear for the future. The citizens were very proud to have such an undertaking in their midst, and he personally wished to congratulate the Dublin Gas Company. They were spending a lot of money on giving greatly needed employment, and without them he did not know where they would have been—especially during the last two years or so. Much money had been spent by the Company on development, and as the result of this development the public generally would benefit. It was remarkable that, while Europe generally had suffered so severely from depression, the Gas Industry should have progressed as it had done. He trusted that the visitors would go away with nothing but good impressions, and that, as the result of the interchange of views, the Industry and all those engaged in it would have many more happy days.

The PRESIDENT voiced the members' appreciation of the Lord Mayor's welcome, and then went on to express the pleasure felt by the members of the Association at the presence of Mr. Gibson. This was, he said, the second occasion on which their proceedings had been graced by the presence of the President of the Institution of Gas Engineers, and they esteemed it a great honour to have Mr. Gibson with them that day.

DISTRICT BRANCHES OF THE INSTITUTION OF GAS ENGINEERS.

Mr. R. E. GIBSON said he was delighted to be present in the capacity of President of the Institution of Gas Engineers. The Institution counted among its members many of the gas engineers in Ireland. Their Association was affiliated with the Institution, and was directly represented on the Council by one of its members. This support by the Association was greatly appreciated. He thought it was desirable that they should come into closer contact with each other, and believed that in course of time they would get closer together than they were to-day. ["Hear, hear."] When framing the by-laws in connection with the Royal Charter, it was decided to make provision for the formation of District Branches of the Institution of Gas Engineers, and he thought that probably this would come to pass at some time or another. Perhaps then the Institution would be of still greater value to the Irish members than to-day. He might point out that the main objects of the Institution were to deal with all technical questions relating to the Gas Industry, to extend technical knowledge, to promote investigation into technical matters, and to provide facilities for gas engineers to meet together to discuss technical subjects. The research work carried out in conjunction with Leeds University had been far-reaching in its effects. Many improvements in the manufacture and utilization of gas had been brought about as the result of the work that had been done. The Institution was in close touch with the other central bodies. All the undertakings that contributed to the central funds he was quite sure got good value for the money that they gave. The Institution, by its extensive schemes of education and research work, was of inestimable value to the Industry in helping to provide well-trained men whose scientific knowledge and practical application of it were of tremendous importance in making for increased efficiency and thus enabling the Industry to carry on its work to greater advantage. In Ireland, doubtless, they had their own special difficulty, but mainly the difficulties were the same as those to be found across the water, and they all needed every help they could get.



THE PRESIDENT.
L. G. YOUNG.

Mr. Young was appointed Manager to the Carlow Gas Company, Ltd., in 1902, and Managing-Director in 1920.

In these days it was necessary to be very wideawake. Within the last thirty or forty years there had been a great change in the attitude of gas undertakings towards their

consumers. The methods of doing things that were in vogue years ago would not do now. They must offer very efficient service. Good salesmanship was now essential to success, and the more fully the Industry's personnel were equipped with knowledge, training, and experience, the more likely were they to succeed. In the words of Sir Francis Goodenough, a gas undertaking must be not merely a gas supply business; it must be a gas service business. ["Hear, hear."] Thus they must be both willing and anxious to undertake every service to the consumer that was necessary to secure that the gas bought would be used to the best advantage, and that this use should be attended by the least possible trouble to the consumer. In order to carry out this programme effectively, it was necessary that all those who came in touch with the consumer should be well trained for the work. In addition to the effective Institution Education Scheme, there was the B.C.G.A. Education Scheme for Gas Salesmanship, which would be very useful.

With regard to the future, they had their difficulties, but there was much to encourage them. They were living in times of extreme trade depression, but the Gas Industry was not suffering to the same extent as most others. It was more alive and more progressive to-day than ever before. It was in the happy position of being able to render good service to the community by supplying heat energy at low cost, but they must see to it that the methods of utilization were thoroughly understood, that appliances were properly maintained, and that they obtained consumers who were satisfied with what they were getting. He was quite sure that not only would the Gas Industry in Ireland continue to hold its own, but that it would advance. He wished them all future prosperity.

PRESIDENTIAL ADDRESS

of Mr. L. G. YOUNG, of Carlow.

My first duty is to thank you sincerely for the honour you have bestowed upon me by electing me your President, and in accepting this honour, I am sure that I have the hearty co-operation of all the members of the Association.

The Carlow Gas-Works are situated on the left bank of the River Barrow, which is at all times subject to flooding, and on this account, side or outside producers were adopted to heat the retorts. The fuel consumption was, however, rather extravagant, and, in consequence, these producers were soon given up and shallow generative settings were installed, the producer having to be built inside a brick and cement tank to keep out the water. These settings give remarkably good results and can compare favourably with others of more elaborate and costly design.

There are three gasholders, whose combined capacity equals our maximum daily consumption. While excavating for the third holder, we had rather a gruesome experience of opening up an old burial ground. This holder is designed for three lifts, the inner lift being the only one at present in use.

A few years ago I had to consider the advisability of increasing our purifying capacity, and in doing so decided not to install four purifiers as is the usual practice in a works of this size, but to have only three equal in capacity to the usual four, the idea being that if the consumption of gas increased, additional purifiers could be added, and consequently all the purifiers would be of a good size. In connection with these a reversing valve was fixed, so that by turning this valve the flow of gas could be entirely reversed without altering the other valves of the purifiers. Our usual practice is to change the flow of gas weekly, and I was somewhat surprised to find that the purifiers are more effective when the gas is flowing in an upward direction, than when it is flowing down.

EFFECT OF SHANNON SCHEME.

Two years ago, when the Association met in Dublin, our thoughts were naturally—How would the Shannon hydro-electric scheme affect the Gas Industry in Ireland generally? For myself, I had no misgivings of any kind, and I am sure others who have had electric competition were also of a like opinion, notwithstanding the free advertisements and boosting that it got.

In Carlow it had the effect of increasing the sale and hire of cookers, fires, &c., because those who were undecided have realized the limitations of electricity for cooking and heating, &c., and are now ordering gas appliances at a greater rate than before. To a large extent this has been the general experience in Ireland, for, looking at the returns that have been published, I find that there has been an increase in the consumption of gas of 1½ p.ct., and the consumers have increased by 11,600. This, to my mind, is rather remarkable seeing the past winter was so mild, and, like other countries, we suffered from trade depression. It shows conclusively that the Gas Industry has not been crushed by the much vaunted Shannon electric scheme.

I think that gas undertakings should have more consideration from the Government and local authorities than they have had, for, as well as paying rates and taxes, they give a lot of employment (besides the actual manufacture and distribution of gas) in the way of freights which are generally given to Irish owned vessels. Also there are dock, railway, and other charges to be paid. In our case these amount to 60 p.ct. of the cost of the coal. It has been stated that by the use of electricity money does not leave the country to buy coal and should be supported on that account, but I have no hesitation in saying that if it were not for the Gas Industry, considerably larger quantities of coal would have to be imported, as coal burned in the raw state does not go anything like so far as when it is converted into gas. Also, there are the bye-products—coke, tar, sulphate of ammonia, &c.—which would have to be imported, as a country could not exist without them.

GAS AND ELECTRICITY.

The public in buying gas or electricity soon find out which suits their requirements best, and it is unreasonable to think that they will pay 1¼d. *plus* valuation charges for a unit of electricity containing 3412 B.Th.U., whereas,

Front Row, Left to Right—L. P. Phillips, F. J. Edmonds, L. G. Young, R. E. Gibson, G. Walmsley.
Back Row, Left to Right—L. W. Dalby, H. L. Adams, D. McIntyre, G. Airth, T. Burke, G. A. Gilmore, A. Law.

for instance, the Carlow Gas Company supplies over 8300 B.Th.U. for 1d. This is not the only advantage gas has over electricity. For cooking and heating it is far more adaptable inasmuch as any degree of heat can be obtained. Also with the modern gas cooker the heat is automatically controlled, thereby eliminating constant care; in fact, a dinner can be cooked without any attention whatever.

It has been found from actual experience that for cooking, 1 therm of gas equals 25 units of electricity, or 1000 c.ft. equals 125 units. Heating and lighting show a similar comparison; therefore it is an easy matter for the public to work out the cost for themselves. Also gas apparatus is cheaper and more substantial than electric.

The Gas Unit.

There is no doubt that the electric unit at a small price appeals to some of the public, and this has induced some gas authorities to adopt a similar method and charge by the unit. To my mind, there is no objection to this, provided that, for comparison's sake, the gas unit is the same as the electric—viz., 3412 B.Th.U.—but when 4000 B.Th.U. is suggested—which is over 17 p.ct. more—and has even been adopted by some gas authorities, this in a large measure defeats its own object, as the public could not be expected to realize the difference or bear it in mind. It has been said that 4000 is an even figure and easy to calculate. If this is the only reason for its adoption, I would unhesitatingly say, retain the therm or 1000 c.ft. basis as the case may be. A much better method would be to have different prices, according to consumption, based on the valuation or size of the house.

The general public ought to be gratified that the Electric Supply Board has increased its charges in order to enable it to pay its way and thus avoid saddling the taxpayers who are not users of electricity by additional taxes. To my mind, the electric supply is subsidized sufficiently already by not having to pay rates for cables in the streets. Gas authorities would like to have a similar concession for their mains and services. In Carlow the amount paid for rates on these equals 1½d. per 1000 c.ft. of gas sold. The total amount paid in rates and taxes is equal to 8d. per 1000 c.ft. sold.

Reserve Fund.

Looking at the figures of the different gas undertakings in Ireland that are published, I am surprised to see such a difference in the output of gas in towns of similar size. There may be many causes to account for this, but I think the chief is lack of capital to provide appliances. It is a debatable point what the actual reserve fund should be. For instance, the Carlow Gas Company had one considerably larger than its capital. Ultimately a few years ago, a portion of it was capitalized by the creation of bonus shares to the extent of 100 p.ct. I may say that this reserve fund was created by not paying all the profits out in dividends, and I can assure anyone that a large reserve fund is very useful in meeting any emergency that may arise, such as coal strikes, &c., thus avoiding passing the extra cost on to the consumers who benefit thereby. Our profits on investments yield 5 p.ct. on the capital as it now stands.

It has been said that "There is a tide in the affairs of men which, taken at the flood, leads on to fortune." I believe that the Gas Industry in Ireland has now reached this point, and it behoves everyone of us who are engaged in it to further its interests to the best of our ability, and our reward will be to see the Industry in Ireland reach such a high position as it has never held before.

The Present Position.

Since writing this address the Free State Government has put a tariff on coal and all other goods used by the Gas Industry imported from Great Britain. There is no question but that these tariffs will hinder the progress of gas in this country, and possibly some of the smaller concerns may have to close-down in consequence. Representatives of nearly all the gas-works met officials of the Government to try to get exemption from at least the tariff on British coals, and pointed out that from past experience Continental coal did not come up to the standard to produce gas of the quality that was prescribed by statute. So far, I regret to say, no concession has been made.

The President Thanked.

Mr. T. N. Walsh (Navan) proposed a hearty vote of thanks to the President for his address.

Mr. F. J. Edmonds (Waterford) seconded this, and it was carried with applause—the President briefly responding.

Position of Gas Companies in the Free State.

Mr. Edmonds said he had another duty to perform, which it was the express wish of the Committee should be carried out that morning. They were gathered together as an Association of Gas Managers of all Ireland. They were not political in their discussions, and therefore he wanted it to be distinctly understood that any remarks he might make were absolutely non-political, and were not suggestive of any comments on the present Government. The gas companies of the Irish Free State were at present suffering from a very big handicap; what it would result in, they did not know. They felt to a certain extent optimistic, but the Committee thought the meeting should take the opportunity of sending out a warning note to the public whom they served that, in the event of the efficiency of the supply of gas being interfered with as a result of an increase in the price of gas throughout the State having to be enforced, it would not be through the wish of the Gas Industry, and that they would regret very much any such steps as might have to be taken. Those connected with the Industry would endeavour to carry on as they had done in the past, and to maintain a highly efficient supply at a price within the reach of all.

He had seen in the public Press a statement coming from a prominent citizen of Cork, to the effect that the gas companies had declared that they would not use German coal, but that they would employ English coal at all costs. They now desired to appeal to citizens who might wish to give the Industry publicity, to be very accurate in their statements, and not to try to put the gas comanies in a position they did not wish to occupy—namely, one of direct opposition to the Government now in office.

President's Medal.

Mr. G. Walmsley (Londonderry) remarked that it was now his privilege to present the President with the Association's medal. Before doing so, he would like to say how pleased he was to see Mr. Young occupying the chair, and to congratulate him on his address. It was perfectly true that gas undertakings—particularly in that country, where they had to import all their coal—should be looked upon with favour by the Public Departments concerned. The President and Mrs. Young had the esteem and affection of every member of the Association. ["Hear, hear."]

The President said that his wife and he would always value the medal as a memento of a happy year of office.

Committee's Report and Accounts.

The Hon. Secretary and Treasurer (Mr. George Airth, of Dundalk) then read the following report of the Committee:

Your Committee have great pleasure in recording that our last conference in Londonderry was a record for attendance. The weather at our trip to Rosapenna, unfortunately, broke down after we arrived, for some time, but still all seemed to enjoy themselves—particularly those who were golfers. Mr. R. Pollock won the Silver Quaich given by Mr. Grant, and the following ladies the putting competition: (1) Mrs. Rooney, Drogheda; (2) Mrs. Walmsley, Londonderry; (3) Miss McIntyre, Dungannon; Miss B. Reid, Ballina. In the evening of Aug. 11 the members and their friends were the guests of the Londonderry Gas Light Company at dinner in the Guildhall, which was preceded by a very fine organ recital given by Mr. James P. Whimster. An exceptionally enjoyable evening was spent, and your Committee have expressed their appreciation of the kindness shown, by sending a framed photograph of the Association taken at the Gas-Works, Londonderry, to their Chairman for hanging in the Directors' Board Room.

The price of coal is the one dark spot on the horizon which will bar our progress at least for some time to come. A deputation from the Irish Association of Gas Managers and the Irish Gas Council waited upon Senator Connolly, acting Minister for the Ministry of Industry and Commerce, and laid their views before him on the coal question in the following manner:

(1) That gas undertakings are public utility concerns, and are compelled by law to maintain and supply gas at a constant pressure and quality; otherwise severe penalties will be imposed.
(2) It is essential that coal of a suitable quality for the manufacture of such gas should be available at a price not greater than that ruling at the present time.
(3) Gas is essentially the poor man's fuel, as it is greatly used in new housing schemes. If gas undertakings are called upon to pay more for their coals, it is inevitable that such extra cost must be passed on to the consumers.
(4) Different qualities of coal are necessary for different types of retorts—vertical and horizontal. Each undertaking must therefore have free choice to select the most suitable coal for its own plant.
(5) The rise in price of coals will result in an increase in the price of coke to bakers, householders, &c. Further, all bye-products will have to be increased, particularly for road surfacing.
(6) Any increase in price will result in putting the smaller undertakings completely out of business, and will altogether stop the larger undertakings from proceeding with development schemes, causing further unemployment to a large number of men.

The Minister for Industry and Commerce telegraphed on July 27 to all gas undertakings in the Free State to send a repre-

sentative to a conference on July 28. There were 32 gas-works represented at this meeting, which was presided over by Mr. Ferguson, Secretary, Ministry of Industry and Commerce, Lord Edward Street, Dublin. It was brought to Mr. Ferguson's notice that a previous meeting had been held, when Senator Connolly presided, and he was given a copy of the previous points brought before that Minister.

The following points were brought before his notice, with considerable force:

(1) That the smaller works, who are numerous in the Irish Free State, will, if any addition is made to the present price of coals, have to close-down. Two specific cases were given by their representatives.
(2) Statutory companies working on a sliding-scale will have their dividends automatically reduced, as prices are increased, and that redress should be given to them.
(3) Coals for the electricity stations and for other Government purposes were not subject to duty, which was an injustice to the gas profession, and most unfair, if a duty had to be imposed.
(4) It will be necessary to import large cargoes of coal from the Continent or United States of America to ensure low freights. Such large cargoes could only be discharged in Cork or Dublin. Thus gas undertakings would have to arrange to get their coals sent to these two ports, which must necessarily greatly increase the cost of coals through additional railway rates. Gas companies have always been allowed extended credits from coalowners in paying their accounts. Now Continental firms will only quote subject to satisfactory guarantees as to payment, and give no analyses of the coals offered. This cash will be very difficult to find, as every company is working, at the smallest margin of profit now, and increased funds cannot be found.
(5) A list of gas-works closed down in the Irish Free State during and since the great coal strike in 1926 was given.

Mr. Ferguson, in reply, said he could hold out no hopes of the remission of the present duty on British coals, and probably it would be increased. The only hope was to find alternative supplies, and go in for co-operative buying from the Continent. The Government could not interfere in making the sellers act up to their guarantees, but would do all in their power to assist us in getting suitable qualities of coal.

Mr. L. G. Young thanked Mr. Ferguson for calling them together, and the representatives retired.

This year only 33 ballot papers have been received, and no nominations were made for officers.

The balance to credit in the Treasurer's hands this year is £123 3s. 6d., as compared with £79 0s. 5d. in 1931.

The AUDITOR (Mr. L. P. Phillips, of Dublin) presented the financial statement.

The report and accounts were adopted, and a vote of sympathy was passed with Mr. J. Ronan, of Waterford, whose daughter had just died.

OFFICERS FOR 1932-33.

The Scrutineers who were appointed to go through the ballot papers (Messrs. C. J. Kelly, Dublin, and P. Comerford, Dublin) subsequently reported the election of the following officers for the ensuing twelve months:

President.—Mr. F. J. Edmonds, Waterford.
Vice-President.—Mr. J. L. Hyslop, Belfast.
Members of Committee.—Messrs. D. McIntyre, Dungannon; J. A. Rooney, Drogheda; M. J. Treacy, Fermoy.
District Representative to Council of Institution of Gas Engineers.—Mr. F. J. Edmonds, Waterford.
Auditor.—Mr. L. P. Phillips, Dublin.
Hon. Secretary and Treasurer.—Mr. G. Airth, Dundalk.

The following additions were made to the membership of the Association:

Members.—Mr. McIntyre, Athy; Mr. Walsh, Balbriggan; Mr. Lusted, Cavan; Capt. Anderson, London.
Extraordinary Member.—Mr. Thomas, Dublin.

THE PAPERS.

Two papers were read at the meeting, and each was discussed.

The contribution by Mr. F. G. M'Elwee (Coleraine), on "Vertical Retorts for Small Gas Undertakings," together with a report of the discussion, will be published in the "JOURNAL" next week.

SOME SALES METHODS ADOPTED AT BALLYMENA.

By C. W. SURMAN, of Ballymena.

In presenting this paper to you I lay no claim for bringing forward any new ideas. The subject of gas sales and distribution matters generally has been presented many times in the past, yet I am of opinion that, provided an instructive discussion ensues, the more often it is presented the better, especially in these times of industrial depression and strong State-aided electrical competition.

I think it can be said that most gas-works are run efficiently from the chemical and engineering aspects. High thermal efficiencies, &c., and up-to-date works with a low cost of gas into holder is eminently satisfactory, and no gas engineer should be satisfied until he is convinced that his works results show no weakness. What good, however, is the most efficient works in the world without an outlet for the commodity which is manufactured? And the larger the use of that commodity the better will be the all-round efficiencies.

It is generally agreed that gas has a most useful service to offer the public, and, provided that service is given in the proper manner, a long life is before the Industry. I think, also, that in the past, when gas was more or less a monopoly, it must be agreed there was too much of that "take it or leave it" attitude, and the competition from electricity, if nothing else, has certainly proved beneficial in stirring the various gas undertakings to greater efforts and a more satisfactory public service. But if gas is to make still further progress and occupy more and more its proper position in the houses and factories, still greater efforts will have to be made, for the day has passed when it will sell itself.

MANAGEMENT AND STAFF.

It is sometimes said that larger undertakings have much better facilities for pushing their products than have the smaller undertakings, but I am one of those who is not in agreement with this statement in its entirety. Do the smaller undertakings make the most of their opportunities? Are they not in many cases afraid to take those business risks which may make the difference between success and failure? One of the first essentials enabling small undertakings to make the most of their opportunities is, in my opinion, the question of staff. I have met managers of small undertakings who have boasted about the smallness of their weekly wages amounts, and while this is to be envied, yet labour economies should not be practised at the expense of efficiency. In a number of small works too much of the manager's time has to be taken up by simple unproductive work which calls for no technical qualifications. In these days of intensive competition I am of opinion that the manager's time could be better spent by developing a closer touch with his sales department and attending to the proper superintendence of the routine of his works than by the performance of those simpler tasks which could be efficiently carried out by the employment of the requisite assistance.

The proper staff will more than repay its upkeep. It will enable the undertaking to be more efficient; sales pushes can be made and developed with greater and more scientific force; a punctual service can be given to the consumer, together with a greater opportunity of making and maintaining that personal touch and goodwill which counts for so much.

It is not possible in a short paper to deal with all the questions one would like, and I propose, therefore, to confine myself to three—namely, showrooms, pay through the meter system, and lighting.

THE SHOWROOM.

It is perhaps not possible for every gas undertaking in Ireland to have really elaborate showrooms, stocked with well-trained attendants. The value of a showroom, however, cannot be over-estimated, and it should be the aim of all undertakings who are not able to acquire more elaborate buildings to have a suitably stocked and easily accessible room where consumers can be shown the latest appliances, and apparatus can be demonstrated to them at a moment's notice. Such a room can with but little expense be tastefully decorated, and in a short time will more than repay any costs which may have been involved.

Five years ago the Ballymena Gas Department had no showrooms, and we laid out a room, which was then used as a cooker and fire store, on the lines I have indicated. A small window of the room fortunately faced the main thoroughfare. Each night we lighted all the various lighting points and changed the shades periodically. The effect created quite a lot of public interest, and soon afterwards inquiries were being made, which in many cases resulted in sales. It was astonishing, also, to find that the public generally had no idea what gas could do. Three years ago, owing to our office accommodation, &c., being only limited, we converted suitable premises in the main thoroughfare into new offices and showrooms, which premises include a demonstration bathroom. The total cost of the work was approximately £2000, and since its opening the sales of apparatus have been steadily growing. We also find that premises such as these have an uplifting effect upon the public mind, which in these days of strong competition is all to the good.

In larger undertakings the showroom is stocked with trained attendants and adequate in number; such policies are not possible in the smaller undertakings. We constructed our showrooms, however, with what may be called

a counter office; the clerk who works here is, therefore, always within the showroom and is trained in the efficiencies, &c., of all the ordinary run of apparatus; anything that is beyond the ordinary is referred to myself.

The method we adopt is that the consumer is first of all circularized with suitable seasonable literature; in a day or two a trained man visits the consumer and, so to speak, tries to create their interest on the door-step. Any consumer who shows the slightest interest is persuaded to come down to the showroom to have the apparatus demonstrated. In cases where we are not successful in drawing the consumer to the showrooms we ask to be allowed to demonstrate the appliance, where suitable, in his own home. A sale is often made in this way.

Hire Purchase.

I think, latterly, the smaller undertakings have come to a fuller realization of the value of extending their hire purchase terms, but there are yet some who have perhaps not gone far enough. There are others who believe in letting out apparatus on simple hire terms, and while it is desirable in certain districts to concentrate more on simple hire apparatus, yet, I think, generally in the smaller towns it is more advantageous to devote the necessary money which would be required for simple hire apparatus to the extension of facilities for the hire purchase of apparatus by putting out the apparatus at net cost and making the term of years as long as possible, thus keeping down the quarterly rentals. In the case of the higher grade cookers, however, I would advocate cost prices, but much shorter periods. Another point in favour of extending hire purchase schemes in preference to simple hire is that a consumer could much more easily be persuaded by the electrical salesman to change gas apparatus on simple hire than he would be if the apparatus was already partly his own property.

Advertising Value of Exhibitions.

Following what may be termed the showroom routine, the practice at Ballymena is to stage a gas exhibition every 12 to 18 months. These exhibitions, judged from the sales of apparatus point of view, are sometimes a ghastly failure, but it cannot be expected that large sales will result every time; rather, I think, it is better for sales to assume a steady stream from year to year. It is my belief that these exhibitions stimulate and keep alive the interests of the consumer, which is advantageous. We are contemplating arranging for periodical cookery demonstrations to be given at suitable times in the showroom window. This, of course, will be merely for the purpose of giving what may be termed a spot advertisement.

Pay Through the Meter System.

From the brief figures given hereunder it will be observed that the output was low in proportion to the size of the town, which has a population of 12,500, and in the early part of 1928 we looked around in an endeavour to find the causes; there were several. Poor and varying pressures were in evidence in certain parts of the area, and, in addition, the quality and specific gravity of the gas were variable. In due course these defects were remedied, and the effects were generally appreciated by the public, who then found that they could rely on their apparatus and that efficient results could be obtained. We found, also, that there were many consumers of the poorer classes who, although willing to install apparatus, were not in a position to purchase outright. We therefore decided to try the experiment of letting out the apparatus and deducting the requisite payments from the rebate moneys at the times of the quarterly collections, and this system has proved an excellent means of increasing the sales of gas. The system has been largely responsible for the increases shown hereunder:

Year Ended.	Amount of Sales of Apparatus by P.T.M. Scheme.	Consumption per Consumer.	Total Sales of Gas in C.Ft.
	£ s. d.		
1926	*Nil*	18,094	37 454,834
1927	*Nil*	18,718	40,804,950
1928	243 5 2	18,312	42.117,446
1929	524 2 6	18,526	45,387,700
1930	496 8 0	18,810	49,848,400
1931	716 10 8	19,201	54 590 000

We extended this system to cover all and every form of gas apparatus, including simple hire and hire purchase rents. We find, however, that in the case of quarterly hire purchase rentals consumers generally prefer to have separate accounts rendered. We make a limit of £2 as the value of the apparatus that can be purchased, but we have found it to be good policy in the case of some consumers to make the system more flexible.

The Lighting Load.

Much has been said and written from time to time about the lighting load. Electrical competition has perhaps spurred gas undertakings to greater efforts in this particular sphere than in any other, and it is distinctly difficult for an unbiased person now to choose between the modern gas lighting fittings and those of our competitors.

I think the value of the public lighting load cannot be over-estimated and should be retained by gas undertakings at all costs, even to the extent of showing a slight loss on its receipts. Its value as an advertising medium is supreme. In addition to the actual selling of the gas, however, we should pay special attention to the proper maintenance of the lamps. We are gradually re-organizing the public lighting at Ballymena and have adopted the practice of taking two or three streets each year and remodelling the system of lighting in them. We have adopted the square lantern (except in special places, such as public squares, &c.) with medium and bijou cluster burners, and we make a special point of paying attention to the maintenance of the lamps, especially their cleanliness.

The shop lighting load is perhaps a more difficult problem for gas undertakings than other forms of lighting, and, in my opinion, the smaller undertakings are in a better position to retain and gain, at any rate, a large percentage of this load. Ballymena has only been faced with electrical competition for the past 18 months, but despite every effort that has been made the majority of the shops have discarded their gas fittings in favour of electricity. We are trying to meet this competition, however, by first of all getting some of the smaller shops who have not changed over to adopt the latest design in suitable fittings. I will mention one case in point. A certain business establishment had practically given the order for the installation of electricity when the owner was approached by the Gas Department, and we were able to persuade him, on certain terms, to allow us to re-fit his shop with superheated cluster burners and suitable reflectors, together with "Newbridge" switches, on the understanding that, if the installation did not give him satisfaction, no charges would be made upon him, and if he decided in its favour the installation would be charged for at net cost, *plus* 3 p.ct. The installation gave satisfaction, and we were able to use this as an advertisement and persuade some of the other consumers similarly situated to do likewise.

With regard to those consumers who have gone over to electricity, we only concern ourselves with trying to win back the inside lighting, and in this connection we are offering to supply suitable cluster superheated burners complete with unbreakable reflectors at cost price, *plus* 3 p.ct., and if a distance control switch is required, at an extra of 10s. 6d. These units are erected midway between the existing electric points. We emphasize the fact that these burners are powerful heat giving units and can be lighted during the day time on dull and damp days, thus giving light at 25 p.ct. cheaper than the price charged for electricity, and at the same time giving off sufficient heat to keep the shop and goods in a dry condition; also, a valuable stand-by is at hand in the case of any electrical failure. We were able to convert several shop owners to this way of thinking during the latter part of last winter, and on comparing their gas consumptions it was gratifying to find that their "stand-by installation" had been used to an extent that their total consumptions were only approximately 10 p.ct. less than they were before electricity was introduced. We are hoping next winter to have a further extension of this business and, in addition, to overhaul all such installations free of charge once every four weeks.

Domestic Lighting: Free Maintenance.

With regard to domestic lighting we are making every effort to retain the load we have. I am not entirely in agreement with the policy of giving away a lot of free fittings, &c. Our motto is, utilize good fittings, make easy facilities for payment, if necessary, and put in the fittings at practically cost price. I think every gas undertaking should have a free maintenance scheme, not necessarily as is generally understood—namely, a maintenance fitter seeking admission every six months or so. Much may go wrong in between these visits. We did commence the practice of regular visits, but without success. The maintenance man averaged 300 calls per week, and at this rate it would have taken 200 days to cover the whole of the consumers, allowing for the services of one fitter only. We therefore decided to give free maintenance to anyone desiring it, which service includes repairing of leaks, cleaning burners, fires, attention to cookers, &c.

We do not, however, wait for the consumer always to notify the Department, and we do not take the attitude

that no news is good news and everything is consequently all right. Whenever any work is being done at consumers' premises, the fitter asks if there are any complaints and attends to everything necessary; also, every three months, when the meter readings are being taken, inquiries are similarly made from each consumer; any complaints are tabulated and attended to. The cost of this service works out at about 0·76d. per 1000 c.ft. of gas sold. It is proving quite satisfactory and keeping the consumers well satisfied, and we are of opinion that the system is a more suitable one than regular visits at long intervals.

The Personal Touch.

We also endeavour to keep in close personal touch with our consumers and adopt the following simple method. All work from simple complaints to large jobs is entered by the office clerks in a specially ruled book, and this book is the commencement of a card index system which we have adopted. All work is posted from this book on to a work card, which is given to the fitter who is detailed to do the job. On the completion of the work the fitter enters every detail of the materials used, time, &c., in the spaces provided, and after the necessary stores checks have been made the card is passed to myself for pricing. Each day I make a practice of setting aside one or two hours for visiting. I take a batch of cards with me (the work to which they refer having been carried out) and call on the consumers concerned. I find that consumers very much appreciate a personal call like this and really feel that an interest is being taken in them. This visit also affords a ready means of making new or additional suggestions which often result in further business and the finding of other fields of potential consumption with other consumers.

The personal touch, in my opinion, is one of the most important items in the sales organization of any gas undertaking, and no undertaking can properly satisfy its consumers without that spirit of goodwill which is best fostered by showing a friendly interest in its consumers.

Discussion.

The President thanked Mr. Surman for his paper, which was one to appeal to every member. There were many small undertakings in Ireland which could hardly go to the expense that Mr. Surman had incurred in the matter of showrooms, but everyone could do something in that line, even if they had to confine themselves to their existing premises. As to hire of cookers, his own experience had been that when the Shannon Scheme came along there was general complaint on the part of consumers that they had to pay for hire of cookers. They could have cookers on hire-purchase or simple hire. Everyone had them on simple hire, but eventually, as he had said, they objected to paying. So the Company went on to hire-purchase, which he thought was perhaps the best plan. There was one objection to a system of payment which involved the counting of the money before the consumers, because when consumers saw a lot of money spread out on the table it made them inclined to economize. He provided a canvas bag for each consumer in Carlow. On each bag there was the name and the number of the meter. The money was counted in the office, and the consumer did not actually see the money that had been put in the meter. Since the Shannon Scheme had come along with its valuation charges, a great many small consumers had gone back to gas, because they objected to these charges, particularly in the summer months.

Mr. J. M'Nicholl (Cork) thought the author was to be congratulated upon his enterprise, and the paper could be studied usefully by undertakings very much larger than that at Ballymena. It seemed a very simple thing to carry out such a programme, but many undertakings neglected to do it. It was difficult to understand the mentality of those responsible for undertakings who allowed themselves to lose business without making the effort that a small concern like this could do. The author had tried the scheme, and found it satisfactory, which was a sufficient answer to anyone who might urge that it was an extravagant scheme. Ballymena was not very far from Belfast, and in Belfast there was one of the most successful gas undertakings. He suggested that proximity to Belfast created a sort of superiority complex among gas undertakings, which might enable them the better to meet the competition with which they were faced. He congratulated Mr. Surman upon following the example so ably set by his larger neighbour.

Mr. A. Law (Limerick) said he had been to Ballymena, and knew what the undertaking was like some years ago. Mr. Surman had not exaggerated matters in his paper. The personal touch was everything. It was hard work, but the reward was well worth the trouble. What was accomplished by the big undertakings affected the small ones, which were often expected to do things as cheaply. Also the fact must not be lost sight of that every small undertaking which went out of business was something of a knock to the big undertakings. Therefore closer co-operation would be welcomed. During the five years he had spent in Ireland he had realized that among the small undertakings there were many which were struggling against great difficulties.

The B.C.G.A. Course.

Mr. F. J. Edmonds (Waterford) said the author's figures showed that since 1928 the annual sales of apparatus by the pay-through-the-meter system had grown from £243 to £716; while since 1926 the consumption per consumer had increased by just over 1000 c.ft., and the total sales had gone up from 37½ million c.ft. to 54½ millions. If proof were needed that the scheme was on the right lines, it was furnished by this statement. He was rather surprised that the author had not taken advantage of the B.C.G.A. Salesmen's Course to educate the staff. Since last year, he (Mr. Edmonds) had himself gone through the course, and he hoped that many in the room had done likewise. To those who had not, he would say that it was a course well worth taking. It would show them how they could get in contact with the consumer.

Mr. L. W. Dalby (Wicklow) said that the introduction of electricity resulted in a very considerable reduction in his consumption; people liked to try anything new. But he had adopted the personal method of dealing with his consumers; the consumer in the back street was as much to the undertaking as the person who took ten or twenty times the amount of gas. The result had been very gratifying. In round figures the sales of gas were 20 p.ct. better than they were with the first onslaught of electrical competition, and in spite of all their troubles this increase was steadily continuing. The figures bore out absolutely Mr. Surman's contention that personal contact and unremitting attention to the wants of the consumers paid handsomely all round, and he was only too pleased to support the author in all that he had said.

"Keep the Consumer Happy."

Mr. J. A. Pemberton (Sligo) remarked that a slogan given to him in the South of England twenty years ago was "Keep the Consumer Happy."

Mr. G. Walmsley (Londonderry) said that the author's showroom scheme showed him to be very courageous, and this courage had been amply rewarded, and the fact that his output had increased practically 50 p.ct. within five years was remarkable, especially in these days of active competition.

Mr. Surman replied to remarks that had been made in the discussion.

Thanks to the Secretary and Auditor.

The President proposed a hearty vote of thanks to Mr. Airth, who was, he said, the life and soul of the Association. ["Hear, hear."] They were also indebted to Mr. Phillips, who did a lot for the Association, and to the members of the Committee.

Mr. W. E. Young (Queenstown) seconded the vote, which was heartily carried.

Mr. Airth, in reply, assured the members that he had the interests of the Association at heart. From reasons of health he had wished to retire a year ago, but now that he was better he felt glad to continue to act as Secretary. Confident that he had the goodwill of every member, he was hoping to carry on for some time to come.

N.G.C. AND B.C.G.A.

The Eleventh Annual Meeting of the Irish District Executive Board of the National Gas Council was held in Jury's Hotel, Dublin, during the afternoon.

In the unavoidable absence of Mr. J. Ronan (Waterford), Vice-Chairman of the Board, the chair was taken by Mr. L. G. Young (Carlow), President of the Irish Association of Gas Managers.

The minutes of the Tenth Annual Meeting of the Board held at the Guildhall, Londonderry, were confirmed and signed, and Mr. J. D. Smith was unanimously elected Chairman of the Board for the ensuing year.

Mr. W. J. Grey and Mr. J. Ronan were unanimously elected Vice-Chairmen.

Mr. H. W. Saville was re-elected Hon. Secretary.

The following were elected members of the Management Committee: Mr. G. Airth, Mr. R. B. Anderson, Mr. W. J. Grey, Mr. A. Law, Mr. R. Healy, Mr. J. McNicholl, Mr. B. Mitchell, Mr. J. O'Flaherty, Mr. J. A. Rooney, Mr. J. D. Smith, and Mr. G. Walmsley.

The following were elected representatives upon the Central Executive Board: Mr. R. B. Anderson, Mr. W. J. Grey, Mr. J. McNicholl, and Mr. J. D. Smith.

At the conclusion of the formal business, Mr. E. J. Fottrell (Joint Manager of the National Gas Council) addressed the members, emphasizing the value of the Central Organizations, and urging the Irish members to avail themselves to the utmost of the services which the National Gas Council was in a position to render.

An exchange of views took place regarding the position which had arisen in the Irish Free State in consequence of the action of the Government in imposing an import duty of 5s. per ton on British coal. Arrangements were made for the collection and distribution of information respecting the analysis of Continental coal and the carbonizing results obtained.

Regret was expressed at the enforced absence of Mr. J. C. Walker, General Secretary of the B.C.G.A., who had sent a letter saying that his doctor refused him permission to travel.

Several suggestions were put forward and discussed in regard to improving the publicity service of the B.C.G.A.

in Ireland, and Mr. Fottrell undertook to communicate these suggestions to Mr. Walker.

Sympathy was expressed with Mr. W. M. Mason in his recent illness, which had necessitated his retirement from the position of Manager of the B.C.G.A.; and the Hon. Secretary was asked to communicate with him stating that they hoped to have the pleasure of seeing him at many of their future meetings.

A vote of thanks was passed to Mr. Fottrell for his attendance, and to Mr. Young for occupying the chair at short notice, after having presided at an earlier meeting of the Irish Association of Gas Managers.

Dinner.

In the evening, over one hundred members, ladies, and friends sat down to dinner in the hotel, on the invitation of the Chairman and Directors of the Carlow Gas Company, Ltd., whose hospitality was keenly appreciated. An excellent programme of song and recitation was thoroughly enjoyed. Proposing "Prosperity to the City of Dublin," Mr. F. J. Edmonds declared that Dublin had a reputation and a history which was surpassed by no other city in the world. Dublin, in the matter of progress, had set a good example to other places, and this progress the Dublin Gas Company had done a great deal to assist. The Lord Mayor's reply was sympathetic, and none doubted his complete sincerity when he expressed the hope that he would soon again have the pleasure of seeing the members in his native city. "Kindred Associations" was submitted by Mr. A. Law, of Limerick. It was replied to by Mr. R. E. Gibson, who voiced the thanks of all present to the President and his Company for their kindness and hospitality; Mr. J. W. McLusky, who said that English and Scottish gas engineers did not regard the Irish engineers as in any way separate from themselves—the aims of all were the same; and Mr. E. J. Fottrell, who assured the members of the earnest desire of the central organizations to assist the Gas Industry of Ireland by every means in their power. Mr. G. Walmsley proposed "Our Popular and Esteemed President and the Carlow Gas Company." He said the shareholders and consumers of the Company were to be congratulated upon having Mr. Young as Managing Director. The President, in his reply, recalled the fact that Carlow was the first town in the country to be lighted by electricity, many years ago. People turned out to see the lighting—and it failed. An old shareholder in the Gas Company was heard to say: "Thank God, my gas shares are safe still!" They had been safe ever since. The Company had always believed in a low price for gas. The remaining toast—that of "The Ladies"—was in the hands of Col. Glover, and was responded to by Mrs. Young.

The Excursion.

The following day was spent upon Hill of Howth, whose glorious views there was none too much time to admire. In addition, the catering of the Waverley Hotel was first-rate in every respect. The journey was by rail to Sutton, and thence by electric tram. Happily the weather was kind. The thanks of all who participated were due both to those who made the arrangements and those who carried them out. There may be an opportunity of reproducing next week one or two snapshots taken during the visit.

An Apparatus for Testing Heat-Insulating Bricks*

By T. H. Blakeley and J. W. Cobb.

The work described below was carried out in order to provide an apparatus, comparatively simple in construction and working, which could be employed to provide makers and users of heat-insulating bricks with information as to the quality of these products, particularly as regards their thermal conductivity. Simplicity and convenience rather than the highest possible order of accuracy, and the possibility of making comparative rather than absolute measurements, were in view from the beginning, although as the work progressed and the results obtained were compared with measurements made on the same products by more elaborate methods at the National Physical Laboratory, it became evident that the results had an absolute accuracy great enough for all practical purposes.

The need for such tests has arisen out of the increasing attention paid to fuel economy in all furnace and similar work. The construction and study of heat balances have indicated where savings might be effected, and in many cases it has been disclosed that the conduction of heat outwards through brick work to the surrounding air or ground has been a source of continuous and serious loss.

The refractory bricks used in the construction of high-temperature furnaces are primarily designed for resistance to high temperature and not for heat insulation. In order to minimize the loss from heat dissipation outwards, the most obvious plan would be to make these refractory bricks of a high insulating quality. Something can be done in that direction by choice of material and by a careful control of porosity, but there are limitations. The face of the brick exposed to the highest temperature must be of a high order of infusibility, and, if it is also a good insulating brick, the fall of temperature from the face backwards through the material of the brick is slower on that account, demanding a still higher order of infusibility than would otherwise be necessary. Again, as in the case of silica, the naturally occurring deposits with the highest porosity such as the diatomaceous earths, and suitable on that account to give high heat insulation, may not be as pure and as resistant to high temperatures as the material normally employed for the making of refractory bricks. So there has arisen a practice in high-temperature work of using a facing course of refractory bricks which may or may not be good insulators, backed by insulating bricks which are not required to resist the highest temperatures of the furnace, although a considerable measure of heat-resistance is demanded from them. This does not exclude the use of insulating bricks directly for the facing course where temperature conditions permit. Moreover, the simplicity of construction so obtainable encourages the production of bricks which combine as far as possible the properties of heat insulation and resistance to high temperature. The so-called insulating firebricks made from a mixture of fireclay and combustible material are an example of this compromise in qualities.

By the method described below, the test of thermal conductivity or insulating power can be carried out on a single commercial brick, although the apparatus can be easily modified so as to test two bricks, or one against a chosen standard. The method chosen is developed from that previously used by Dougill, Hodsman, and Cobb, in which the lower face of the brick was maintained at the higher temperature, and the amount of heat conducted was measured by the amount of water evaporated from a calorimeter set on the upper cooler face, but apart from modifications in detail, on account of the smaller quantity of heat transmitted, the calorimeter was displaced by a blackened slab of metal exposed to the air, the heat loss from which could be calculated. Recent work on the subject has made such a calculation for the degree of accuracy required both simple and reliable. Details are given below and examples of the results obtained.

It appears that insulating bricks of well-known makes made from diatomaceous earth—English, Irish, Danish, and American—conduct, roughly speaking, one-third as much heat as insulating firebricks, one-tenth as compared with ordinary firebricks, and one-fiftieth as compared with magnesia brick. In making the test on an insulating brick it is desirable to note any shrinkage or cracking which appears on the hot face at a high temperature, say, 1000°, in the course of the test, since such a defect, if pronounced, would disclose a liability of the particular brick to failure in use. Increase in porosity usually, but not necessarily, increases the insulating power, but if this increase in porosity is not obtained with great care in manufacture, with the object of securing fine and uniform porosity, it is liable to be accompanied by a low resistance to crushing strain.

Experimental and Detailed.

Thermal conductivity is defined as the rate of heat flow through the material per unit of temperature gradient—*i.e.*, $k = (Q/At) \div d\theta/dx$, where k is the conductivity of the material, and Q is the quantity of heat flowing in time t through an area A of the material measured perpendicularly to the direction of heat flow; the temperature gradient $d\theta/dx$ is the rate of change of temperature (θ) with the length (x) along the line of heat flow. The methods suitable for measuring the conductivity of high-temperature insulators may be developed from those used

* Read at a joint meeting of the Yorkshire Section, Society of Chemical Industry, and the Refractories Association, on Dec. 12, 1931.

for conductivity determinations on refractory materials. Hence the following brief account deals with methods used mainly for the latter purpose.

Historical.

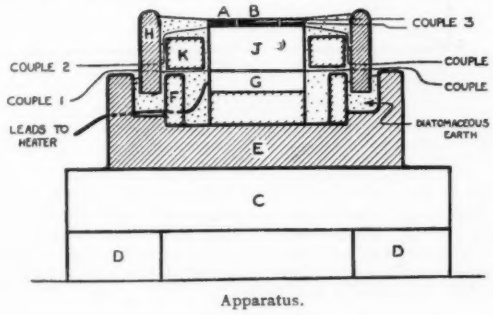
Wologdine[1] for his tests on insulating and refractory materials used a circular test-piece with bevelled edges, and measured the heat flow with a water-flow calorimeter. Dougill, Hodsman, and Cobb[2] modified Wologdine's method. Their apparatus used commercial bricks, and did not require test-pieces of special shape. Also, a totally different type of calorimeter was used. The heat flow was measured by the evaporation of water from a vessel of known area. This vessel was surrounded by a second vessel from which water was evaporated and re-condensed, but not measured. The latter vessel served as a guard ring to the former, ensuring as far as possible that heat flowed in parallel lines through the central area on which measurements were taken. A similar method, with the guard-ring principle applied to a water-flow calorimeter, was used by Goerens and Gilles[3] and later workers including Boyd Dudley[4] and Griffiths.[5] Norton[6] used a noteworthy method, achieving the object of the guard ring by adjusting the temperature gradient in the material surrounding the test-piece to the same value at all points as in the test-piece.

All these measurements depend on the measurement of the heat after it has flowed through the test-piece, but there are other methods in which the heat is measured before passage through the material. Such methods as usually applied are not suitable for testing bricks, even when comparative conductivities only are required. Clement and Egy[7] used such a method for fireclay, but the necessity of making the specimen in the form of a hollow cylinder is a disadvantage. Gard and Robinson[8] employed a similar method for the testing of insulating powders; here the method would appear more suitable, the need for ramming the powder into a hollow cylinder not being objectionable. Fitzgerald[9] and Lichtin[10] surrounded an electrical source of heat with a "box" of the material under test, and observed internal temperatures attained with a given heat input, in order to compare the insulating values of the various materials. An electrical heat input method, using a central plane heater surrounded by a guard ring of accessory heaters, has been employed at the National Physical Laboratory.[11]

Yet another device has been to determine the diffusivity of the material, and multiply this by the product of the specific heat and the specific gravity to obtain conductivity. This method has been used by Heyn, Bauer, and Wetzel,[12] and by Green.[13]

The Present Apparatus.

Our own apparatus, to be described, was designed primarily for simplicity, but though originally intended for the comparison of thermal conductivities, with some brick as an arbitrary standard, it has been found possible with advantage to express the results in absolute units.



Apparatus.

Fig. 1.

The apparatus (fig. 1) is essentially a modification of that of Dougill, Hodsman, and Cobb, a modification in which the difference in temperature of the air and of a dull black surface, radiating and convecting freely to its surroundings, is used as a measure of the heat flowing through the test brick. As in the parent apparatus, commercial bricks are tested. The place of the evaporation calorimeter is taken by a brass block (A) 9 by 4½ by ¼ in. thick, drilled at the centre with a 2-in. hole. A brass disc (B) ¼ in. thick by 1⅝ in. diameter is held in this hole by asbestos fibre rammed into the $\frac{1}{32}$-in. gap. A $\frac{3}{32}$-in. hole extends horizontally along the minor axis of the block to the centre of the brass disc. This hole received a copper-constantan couple (couple 3) so that the hot junction is at the centre of the disc. The surface of the block, including the central disc, is painted with a mixture of ivory black, turpentine, and gold size proportioned to give a dull black surface having no tendency to rub off. The central disc acts as a calorimeter, the rest of the block as guard ring. The loss of heat from the surface of the disc is calculated from the excess of the temperature over that of the surrounding air. Some tests described later were made which indicated that the equations used were applicable to the conditions obtaining in the apparatus.

The apparatus is built on a fire-clay slab (C) which in turn is raised from the bench by bricks (D). Fine asbestos cast with plaster of Paris forms a base and outer wall (E) to the apparatus. Diatomaceous concrete (4 : 1 by volume of diatomaceous earth and Portland cement) forms the inner wall (F), which with the outer wall constitutes a trough wherein the upper half of the apparatus can be raised or lowered. An electrical heater (G) is packed up from the base to be level with the walls. The heater is made by winding nichrome ribbon round a fireclay tile, 9 by 4½ in. This is then bedded on a second tile with a mixture of one part of fireclay and three of powdered firebrick with water. The mixture is also applied to the upper surface of the heater and trowelled to a smooth level surface. An ammeter and resistance control the electrical input. The resistance of the heater is about 10 ohms, and 10 amp. is the maximum current used. A sheet-iron casing (H) lined with diatomaceous concrete and asbestos forms the retaining wall for the upper part of the apparatus, and slides in the above-mentioned trough. The height of the top of the casing is adjusted by varying the amount of diatomaceous earth in the trough.

The remainder of the apparatus may be described in outlining the method of carrying out a test on an insulating brick. The opposite faces of the brick are scraped as necessary to obtain a level surface with a hacksaw blade, care being taken to ensure uniformity of thickness. The thickness of the brick is measured by vernier callipers. Shallow grooves, to receive thermocouples, are cut on the minor axes of the upper and lower faces of the brick. The amount of diatomaceous earth in the trough is varied until, when the test brick (J) is in position, the top of the casing (H) is ¾ in. above the upper surface of the brick. When the brass block is later placed on the brick, this leaves the block surface ½ in. below the level of the top of the casing. A platinum/platinum-rhodium thermocouple (couple 1) is stretched with its hot junction central across the heater surface. The test brick (J) is placed in position on the heater so that the couple fits into the prepared groove. The brick is surrounded with diatomaceous concrete packing blocks; this facilitates the subsequent packing with diatomaceous earth. A copper-constantan thermocouple (couple 2) is stretched across the groove on the upper surface of the brick with the hot junction at the centre of the face. The metal casing is then placed finally in position. Diatomaceous earth is packed round the brick and assembly completed by placing the brass block and central disc, carrying the hot junction of a second copper-constantan couple (couple 3), upon the brick, and smoothing out the earth around the block to a level with its surface.

The current to the heater is now switched on, and the external resistance cut out to give the maximum current through the heater. When the hot-face temperature reaches a suitable value, say 700°, the current is cut down and thereafter adjusted to maintain this hot-face temperature. Readings of the temperatures of the cool face and of the brass block, as well as of air temperature, are taken at intervals. Air temperature is measured by a mercury thermometer placed 2 ft. from the apparatus, and with its bulb screened by a cylinder of polished metal from radiation and draughts. The readings of the cool-face temperatures give a heating curve, which is useful, as described later. Readings are taken until thermal equilibrium is attained, when the final readings are used to calculate the conductivity. When heating curves are not required, but further conductivity determinations at other temperatures are desired, the current through the heater may be set at a suitable figure, such as 4 amp. (a typical value), and the apparatus left for about 8 hours to attain equilibrium.

Calculation of Results.

The final readings of the hot and cool face temperatures when equilibrium is attained, coupled with the brick thick-

1 Bull. Soc. d'Encour., 1909, **3**, 879.
2 J.S.C.I., 1915, **34**, 465.
3 Stahl u. Eisen, 1914, **34**, 500.
4 Trans. Amer. Electrochem. Soc., 1915, **27**, 285.
5 Proc. Faraday Soc., 1917, **12**, 193.
6 J. Amer. Ceram. Soc., 1927, **10**, 30.
7 Physical Rev., 1909, **28**, 71.
8 J.S.C.I., 1930, **49**, 131T.
9 Trans. Amer. Electrochem. Soc., 1912, **21**, 535.
10 Chem. Met. Eng., 1921, **24**, 388.
11 See "Dictionary of Applied Physics," **1**, p. 434.
12 Stahl u. Eisen, 1914, **34**, 832.
13 Trans. Ceram. Soc., 1921, **21**, 394; 1925, **24**, 228.

TABLE I.—$H = H_c + H_r$. *Heat Loss from Dull Black Horizontal Surface Facing Upwards.*

$T_p - T_a$.	H_c.	Air at 10°.		Air at 15°.		Air at 20°.		Air at 25°.	
		H_r.	$H_c + H_r$.	H_r.	$H_c + H_r$	H_r.	$H_c + H_r$.	H_r.	$H_c + H_r$.
°									
20	92	97	189	102	194	107	199	113	205
40	220	215	436	227	447	237	457	249	469
60	366	357	724	375	741	393	759	412	778
80	524	528	1052	552	1076	578	1102	604	1128
100	692	728	1421	760	1453	794	1487	829	1522
120	870	962	1832	1004	1874	1048	1918	1092	1962
140	1054	1233	2287	1285	2339	1340	2394	1394	2448
160	1246	1547	2793	1610	2856	1674	2920	1742	2988
180	1441	1905	3349	1979	3423	2058	3502	2135	3579
200	1646	2313	3959	2401	4047	2491	4137	2584	4230
220	1856	2777	4633	2879	4735	2982	4838	3103	4959

ness, give the temperature gradient. In addition the rate of heat flow through the brick per unit area must be known before the conductivity can be calculated. The heat-flow factor is derived in the following way from the difference in temperature between the central disc of the block surface and the air.

Let T_p and T_a be the absolute temperatures, on the Centigrade scale, of the disc and the air respectively. The heat loss (H) from the surface is the sum of the losses due to convection (H_c) and to radiation (H_r). Taking the values of Griffiths and Davis[14] for the heat loss from a horizontal plane surface facing upwards, $H_c = 2{\cdot}19(T_p - T_a)^{1{\cdot}25}$ Calories per sq. m. per hour, $H_r = 4{\cdot}82[(T_p/100)^4 - (T_a/100)^4]$ Calories per sq. m. per hour. The heat losses calculated from these equations are given for various temperatures in Table I. and fig. 2. These results are employed in the conductivity calculation as follows:

Example.—Brick A3, thickness 4·55 cm., hot-face temperature = 830°, cool-face temperature = 130°, temperature head = 700°. Temperature gradient = 700/4·55 = 154° per cm. Air temperature = 17·5°. Disc temperature = 119·5° Difference in temperature = 119·5° − 17·5° = 102°. Corresponding heat loss (from fig. 2) = 1500 Cal./sq. m./hr. or 150 cal./sq. cm./hr. Thermal conductivity = heat loss ÷ temp. gradient = (150/3600) ÷ 154 = 0·00027 c.g.s. unit.

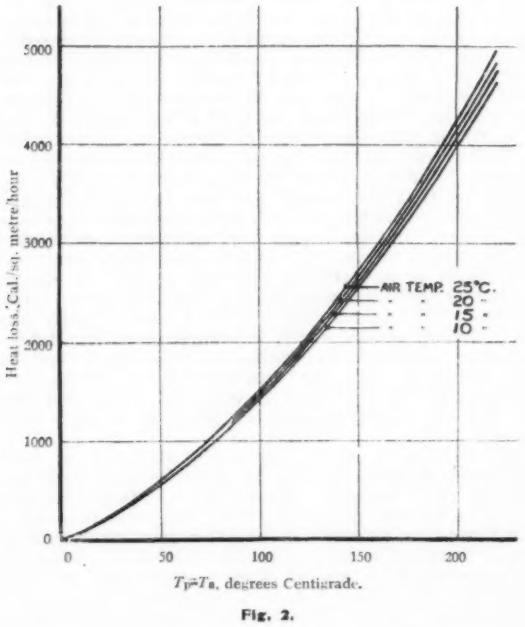


Fig. 2.

In this case, and indeed in all cases where the contact between the disc and the brick is good, there is no appreciable error introduced by taking the disc temperature as indicating that of the cooler face of the brick, so dispensing with the use of a thermocouple in that position. This is often a convenience.

It was thought interesting to make an approximate check on the calculated heat losses under experimental conditions. For this purpose a flat electrical heater, 9 by 4½ in., was placed in the apparatus in the place normally occupied by the test brick, and covered by the brass block. The input to the heater was measured by a wattmeter. Heat was lost other than from the block surface, for part of the heat input travelled downward and outward to the iron casing and the diatomaceous earth surrounding the block. From the surface temperatures of the casing and of the diatomaceous earth, the heat loss other than from the block surface was calculated to be 15-20 p.ct. of the total heat input, air temperature being 20°. When the total heat inputs were plotted against the temperature differences (fig. 3), the points fell close to a curve such that at

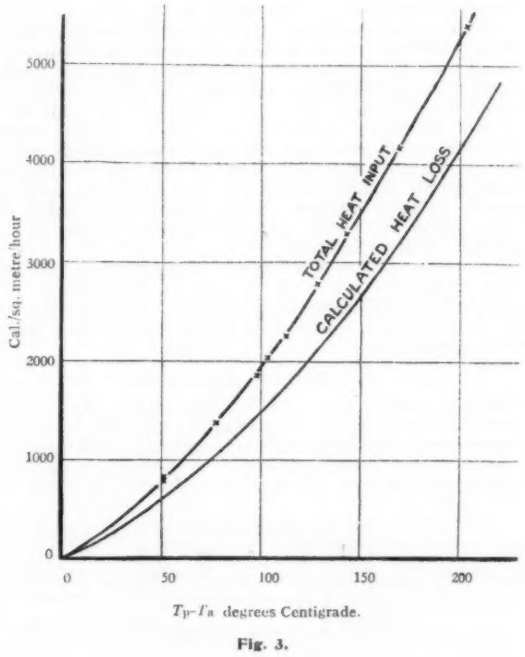


Fig. 3.

all points the calculated heat loss was about 22 p.ct. less than the total heat input, as compared with the estimated 15-20 p.ct. As the estimated heat loss other than from the block surface was necessarily approximate, the agreement between calculated and experimental heat losses was considered to be sufficiently close.

RESULTS.

Experience with the apparatus has indicated that, for good insulators with a conductivity of about 0·0003 c.g.s. unit, deviation from parallel-line heat flow through the interior of the brick under the central disc becomes serious when the thickness is 3 in. Thus conductivity results obtained under such conditions may be 10 p.ct. below the true value, taken as that obtained in the apparatus with a thin layer of the material. Although this does not affect the comparison of two similar bricks, as distinct from the determination of their absolute thermal conductivities, it was considered advisable, since bricks ranging in conductivity from 0·0002 to 0·0009 were to be tested, to restrict readings when possible to bricks at a thickness of about 2 in. At this thickness a sufficiently close approximation to parallel-line heat flow may be obtained over the central area. This difficulty is much less pronounced with less efficient insulators, such as insulating bricks made with

[14] See Fishenden, Gas J., 1930, **190**, 730.

TABLE II.—*Tests of Insulating Bricks.*

Brick.†	Apparent Sp. Gr.	Porosity P.Ct.	Crushing Strength, Lbs./Sq. In.	*t/d* Min.	Temp. Range. °C.	Mean Temp., °C.	Conductivity, C.G.S.	Mean Temp., °Fahr.	Conductivity, British Units.	Fusibility, Equiv. Cone No.	Appearance of Cone after Test.
A1	0·67	73·2	315	..	304– 64	184	0·00028	363	0·82	..	..
					440– 87	264	0·00031	509	0·89		
					674–121	398	0·00033	748	0·95		
					767–135	451	0·00035	843	1·01		
					990–174	582	0·00038	1080	1·10		
A2	0·68	73·0	255	18·0	386– 87	236	0·00033	457	0·95	19	Buff, shrunken
					670–132	401	0·00036	754	1·03		
					809–161	485	0·00039	905	1·14		
					829–166	497	0·00039	927	1·14		
					1003–217	610	0·00043	1130	1·25		
A3	0·58	76·4	320	22·8	366– 66	216	0·00024	421	0·70	11	Black, much shrunken
					486– 79	282	0·000235	540	0·68		
					667–106	386	0·000245	727	0·71		
					830–130	480	0·00027	896	0·79		
					1016–156	586	0·000285	1087	0·83		
B1	0·73	66·8	550	21·0	486– 95	290	0·00036	554	1·05	13	Buff, shrunken
					677–125	401	0·00039	754	1·12		
					839–153	496	0·00041	925	1·20		
					990–175	582	0·00042	1080	1·22		
B2	0·44	79·5	103	21.0	533– 90	312	0·000265	592	0·77	10	Buff, much shrunken
					667–110	388	0·00028	730	0·81		
					856–139	497	0·00032	927	0·93		
					986–163	574	0·00035	1065	1·02		
					1040–174	607	0·00037	1124	1·08		
C1	0·44	77·5	315	23·6	498– 64	281	0·00017	538	0·49	Above 26	White, shrunken
					622– 77	350	0·00018	662	0·52		
					665– 77	371	0·00018	700	0·53		
					667– 78	372	0·00018	702	0·53		
					814– 90	452	0·000185	845	0·54		
					917–102	510	0·00020	950	0·58		
					1043–103	573	0·000205	1064	0·59		
C2	0·61	70·5	175	18·4	468–110	289	0·00043	553	1·24	26	Grey, with white unfused grains
					668–144	406	0·00045	763	1·30		
					837–175	506	0·00050	943	1·45		
					848–176	512	0·00048	954	1·39		
					992–202	597	0·00051	1106	1·49		
D1	1·19	54·5	475	17·5	383–129	256	0·00079	493	2·30	29	Brown
					492–155	323	0·00080	613	2·33		
					665–198	431	0·00085	807	2·48		
					778–228	503	0·00090	937	2·60		
					832–241	536	0·00091	997	2·65		
D2	1·24	54·2	790	17·6	666–198	432	0·00083	809	2·40	29	Grey
					796–232	514	0·00089	955	2·58		
					947–268	607	0·00096	1124	2·78		
E	0·59	74·0	130	22·9	495– 88	292	0·00024	558	0·70	..	..
					610–104	357	0·000255	675	0·74		
					665–113	389	0·00027	732	0·79		
					789–131	460	0·000285	860	0·83		
					910–147	528	0·00029	982	0·85		
Firebrick*	1·95	23·3	..	..	825–260	542	0·0029	1008	8·5	..	..
Magnesia brick*	2·40	31·4	..	..	600–400	500	0·0148	932	43·0	..	..

* Typical results (Dougill, Hodsman, and Cobb, *loc. cit.*) quoted for comparison.
Apparent specific gravity—the mass per unit volume (including pores).
Porosity—the ratio of the volume of open pores to the total volume (including pores).
Crushing strength—an approximation only.
t/d—the time in minutes required for the temperature of the cooler side of a 1 cm. thick layer of the material to cover 90 p.ct. of its total temperature change with respect to air temperature, when the temperature of the opposite face is suddenly raised to a constant temperature.
Mean temperature—the mean of the hot- and cool-face temperatures.
Conductivity, c.g.s.—calories per sq. cm. per sec. for 1-cm. thickness and 1° C. temperature difference.
Conductivity, British units—B.Th.U. per sq. ft. per hour for 1 in. thickness and 1° Fahr. temperature difference.
† See text for further description.

a fireclay basis; the values resulting with these at 3 in. and 2 in. thickness were in agreement.

The conductivity results from tests on a number of bricks are given as examples in Table II. and fig. 4. The makers' descriptions of the bricks have been used. Summarizing briefly the type and behaviour of several bricks tested: A1 and A2 were two bricks made under slightly different conditions from an English diatomaceous earth using a clay bond. Both A1 and A2 contracted slightly on the hot face at 1100°, but did not develop cracks. A3 was also an English brick made from the same earth, but without the admixture of fireclay. It was unaffected by a temperature of 1000°.

Bricks B1 and B2 were English-made bricks with a basis of Danish diatomaceous earth. B1 was unaffected at 950°, but at 1050° it contracted sufficiently to cause extensive cracks on the hot face. It was not claimed by the makers as suitable for use above 950°. B2 differed visibly from B1 in containing larger pores and hollows, and withstood a temperature of 1000° without contraction or cracking.

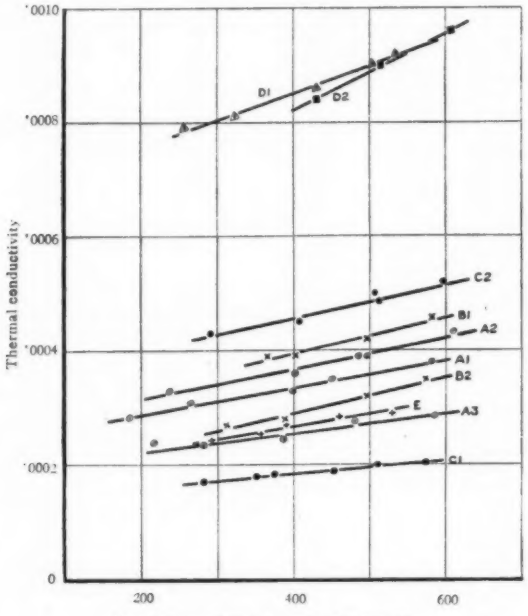
C1 was a brick cut direct from an American deposit of diatomaceous earth, and not subjected to heat treatment before use. Temperatures above 900° caused contraction, which may result in splitting along the natural laminations of the brick. 870° is the limit of temperature specified by the makers for the use of this brick. C2 had a basis of the same earth, but its composition and treatment during manufacture make it utilizable, according to the makers, at much higher temperatures than C1. It was quite unaffected in our tests.

D1 and D2 were insulating bricks with a fireclay base, differing from firebricks in their higher porosity, presumably due to the incorporation of incombustible material in the fireclay before firing.

E was an English-made brick with a basis of diatomaceous earth from Northern Ireland. 1000° caused slight contraction, but no cracking.

Table II. also contains data on other physical properties of the bricks. The specific gravities and porosities were determined by weighing a piece of the brick in air, soaking in a vacuum desiccator in paraffin of known density, and weighing, first in air, and then suspended in paraffin. In-

creasing porosity is usually associated with decreasing specific gravity, and also with decreasing thermal conductivity, owing to the important part air spaces play in thermal insulation. It may be noted, however, from our results that the brick B2 had a higher porosity than C1,



Mean temperature, degrees Centigrade.
Results with bricks.

Fig. 4.

and at the same time a higher conductivity. This may be attributed to the lower efficiency as thermal insulators of the larger pores in the brick B2, as compared with the minute pores of the C1 brick. Percentage porosity is not an infallible guide to the insulating value of a brick. For most purposes what seems desirable is the highest possible development of uniformly fine porosity consistent with sufficient cohesion.

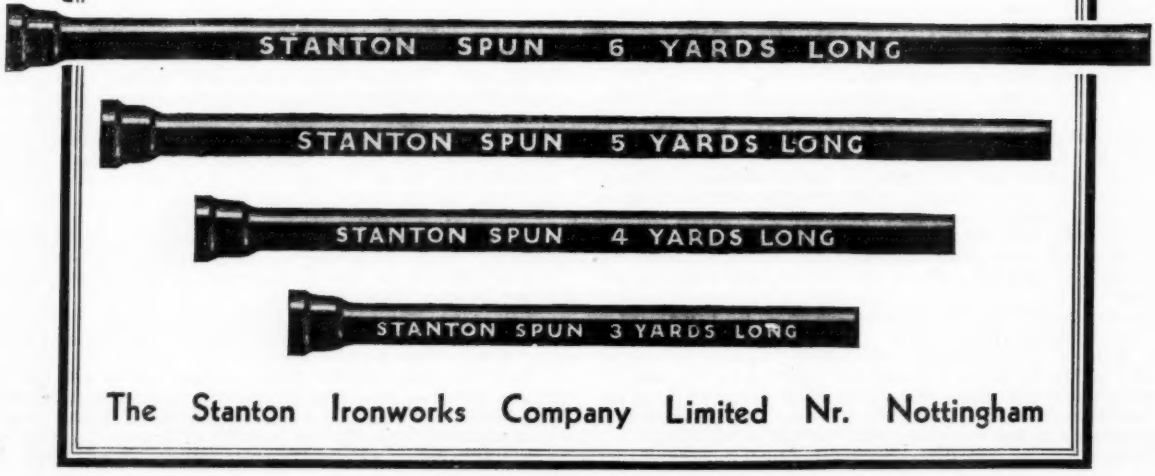
The crushing strengths were determined in the cold on 1-in. cubes of the bricks. They are approximations only and, particularly with the weaker bricks, are much lower than would be obtained by testing whole bricks, but their comparison has some interest. Fusibilities were determined by comparison with Seger cones. It may be noted that the temperature up to which insulating bricks may be used is limited not by fusion, but by excessive contraction, causing cracks and fissures and the destruction of pores, or, in the case of bricks cut from deposits of diatomaceous earth, by splitting along the cleavage planes. The temperatures at which these phenomena occur may be determined by inspection of the hot face of the brick after it has been heated in the apparatus for the determination of conductivity or by *ad hoc* experiment.

Heating Curves.

Thermal conductivity governs heat transference when a steady state has been reached—*i.e.*, when thermal equilibrium has been attained. This condition is commonly satisfied when considering the heat loss through the outer wall of a furnace which is maintaining its working temperature, the minimizing of which loss is a principal function of thermal insulating materials. When and where temperatures are changing, thermal equilibrium does not exist, and conductivity alone does not determine the heat transference. The heat capacity per unit volume of the material then assumes importance. Diffusivity, or thermometric conductivity, is the characteristic property of this variable state, and is determined by the ratio of the conductivity to the volume specific heat.

The apparatus described is not designed for the study of the variable state. Nevertheless, useful information concerning it may be obtained during a conductivity determination. The temperature of one face of the brick, as already described, is brought up quickly to some desired value from a lower temperature, usually that of the air, and there maintained. The temperature of the cool face of the brick will rise, and tend to a constant excess above air temperature. The increase in the excess may be plotted against the time elapsing from the initial changing of the

STANTON
DELAVAUD
Spun Iron Pipes
3, 4, 5 and 6 Yards Long



The Stanton Ironworks Company Limited Nr. Nottingham

thermal conditions to give a "heating curve." Brick A1 was thus tested at various thicknesses, and the corresponding heating curves are given in fig. 5. Inspection of these curves shows that as the thickness is decreased, the time required to attain a close approximation to thermal equilibrium also decreases. This time is difficult to define; it is taken, for the present purpose, as proportional to the time (t) required for the excess of the cool-face temperature over that of the air to cover 90 p.ct. of its total change. The values so obtained correspond with the points marked × on fig. 5. The results are summarized in the following table:

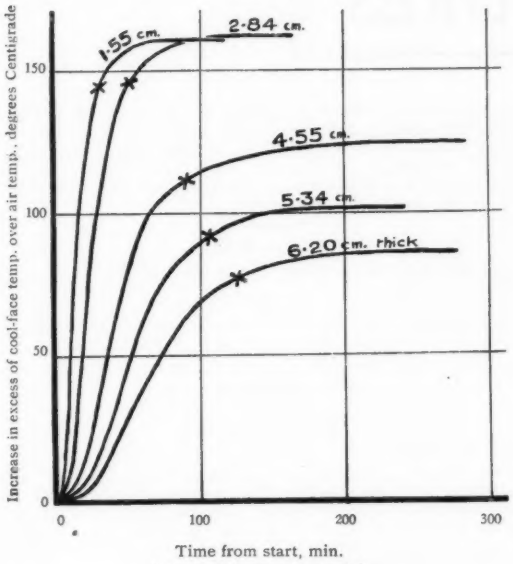


Fig. 5.

Range of Hot-Face Temperature.	Thickness of Brick, d.	Time t (See above).	t/d
°	Cm.	Min.	
17–670	6·20	127	20·5
17–670	5·34	107	20·0
17–670	4·55	92	20.2
17–670	2·84	52	18·3
17–490	1·55	32	20·5

Thus, within limits of the temperature range covered and of the thickness of the brick, the quantity t/d was nearly constant. If desired, the results of heating curve determinations on a number of bricks of different thicknesses may be reduced to a standard thickness of, say, 1 cm. for the purpose of comparison. This quantity t/d, which is expressed in minutes per unit thickness, is a guide to the rapidity with which the temperature at one side of a block of the material will attain equilibrium again when the temperature at the other side is altered—as when an insulated furnace door is replaced. Values of t/d for most of the bricks tested are given in Table II. Bricks with a higher t/d value will take longer to attain equilibrium when thermal conditions are altered.

[We are indebted to the "Journal of the Society of Chemical Industry" for the loan of the blocks which illustrate the paper by Mr. Blakeley and Prof. Cobb.—Ed. "G.J."]

Gas Companies' Results.

Camborne.

There has been a slight reduction in the demand for gas from the Camborne Gas Company, Ltd., during the past year, due no doubt to the industrial depression in the district. The balance standing to the credit of profit and loss account, amounting to £4085, the Directors recommend should be appropriated as follows: In paying a dividend at the rate of 5 p.ct. per annum (less income-tax); and in carrying to the next account the sum of £3373.

The Model Coin Collector

Reduced Prices

Painted and lettered as required

TELEPHONES
Manchester 2289 Collyhurst
Nottingham 75202
Watford 2645

TELEGRAMS
Sawer, Manchester
Sawer, Nottingham
2645, Watford

THE ORIGINAL and STILL THE BEST
Sole Makers:—
SAWER & PURVES
(Branch of Meters Ltd.)

NELSON METER WORKS MANCHESTER
14, DERBY ROAD WATFORD
RADFORD METER WORKS NOTTINGHAM

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

A distinctly cheerful atmosphere marked the closing of the Account on Friday last, and in spite of holiday influences quite an appreciable volume of business was recorded, particularly in the more speculative groups. During the week the official statement relative to the 5 p.ct. War Loan conversion scheme was published, and showed that nearly 90 p.ct. of the loan, excluding delayed applications, had been assented. This result, which exceeded the most sanguine anticipations, should have the most beneficial effects and definitely stabilizes this country's credit on a 3½ p.ct. basis.

Business in Gas stocks and shares was on a smaller scale last week and confined for the most part to Gas Light, South Metropolitan, and Imperial Continental issues. Prices, however, continued firm, and the only changes of note were in Alliance and Dublin 4 p.ct. debenture with a gain of 7½ points to 85, and Colombo 7 p.ct. preference which rose 1s. to 19s., while the Gas Light units declined 6d. to 23s.

The following interim dividends have been announced: Barnet, 3½ p.ct.; Croydon, 2½ p.ct. on the maximum dividend stock and 3½ p.ct. on the sliding-scale stock; Derby, 3½ p.ct.; Hastings and St. Leonards, 3½ p.ct. on the 5 p.ct. converted stock and 2¾ p.ct. on the 3½ p.ct. converted stock; Lea Bridge, 4¼ p.ct.; and Liverpool, 3 p.ct., all of which are at the same rates as a year ago.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Aug.* 22.

There is very little change to report in the prices of tar products. To-day's prices are:

Pitch, 95s. to 97s. 6d. per ton f.o.b.

Creosote, 3½d. to 5d. per gallon f.o.b., according to specification.

Refined tar is 4d. to 4¼d. per gallon in bulk at makers' works.

Pure toluole is about 2s. 5d.; pure benzole, about 1s. 8d.; 95/160 solvent naphtha, 1s. 4½d. to 1s. 5d.; and 90/140 pyridine bases, 3s. 9d. to 4s.—all per gallon naked at makers' works.

Tar and Tar Products in the Provinces.

Aug. 22.

The average prices of gas-works products during the week were: Gas-works tar, 34s. 6d. to 39s. 6d. Pitch—East Coast, 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. f.o.b.* Toluole, naked, North, 1s. 7½d. to 1s. 9d. Coal-tar crude naphtha, in bulk, North, 5d. to 5½d. Solvent naphtha, naked, North, 1s. 2½d. to 1s. 3d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2½d. to 3d.; low gravity, 1½d.; Scotland, 2½d. to 3d. Heavy oils, in bulk, North, 4¾d. to 5¼d. Carbolic acid, 60's, 1s. 7d. to 1s. 7½d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Aug.* 20.

Throughput continues on a moderate scale, and quotations show little or no alteration. Water white spirits are receiving more attention, but orders remain scarce.

Crude gas-works tar.—Actual value is 55s. to 60s. per ton *ex* works.

Pitch.—Production is increasing slightly. Values are steady at 85s. to 90s. per ton f.o.b. for export and 90s. to 95s. per ton *ex* works for home trade.

Refined tar to Ministry of Transport Specification is quiet for the season, but quotations remain at 4¼d. to 4½d. per gallon f.o.r. in buyers' packages.

Creosote oil.—While supplies of best grade are not too plentiful, quotations are unchanged. B.E.S.A. Specification is 3½d. to 3¾d. per gallon; low gravity, 3⅜d. to 4d. per gallon; and neutral oil, 3⅜d. to 4d. per gallon—all *ex* works in bulk.

Cresylic acid.—Orders remain scarce, with quotations irregular. Pale, 97/99 p.ct., is 1s. to 1s. 1d. per gallon; dark, 97/99 p.ct., 11d. to 1s. per gallon; and pale, 99/100 p.ct., 1s. 2d. to 1s. 3d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha.—Value is steady at 4½d. to 5d. per gallon, according to quality.

Solvent naphtha.—90/160 grade is 1s. 2d. to 1s. 3d. per gallon, and 90/190 grade is 11d. to 1s. per gallon.

Motor benzole is being held for 1s. 2½d. to 1s. 3½d. per gallon *ex* works in bulk.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time.

	s.	d.		s.	d.	
Crude benzole	0	8½	to	0	9	per gallon at works
Motor ,, ...	1	3½	,,	1	4	,, ,, ,,
Pure ,, ...	1	7	,,	1	8	,, ,, ,,

Trade Notes.

Change of Address.

The British Aluminium Company, Ltd., Adelaide House, King William Street, London, E.C. 4, are removing their Warehouse from 34-38, Banner Street, Golden Lane, London, E.C. 1, to 23-25, Pancras Road, N.W. 1. On and from Aug. 29, all communications for the London Warehouse should be addressed to their new premises.

Messrs. Crane, Ltd.

Messrs. Crane, Ltd., the manufacturers of British Standard malleable iron pipe fittings and "Pall Mall" radiators, vacated their new building in Pall Mall on Aug. 20, in accordance with their decision to withdraw from the trade in sanitary equipment, and have removed to their former Head Offices at 45-51, Leman Street, London, E. 1, where additional office accommodation has been prepared in areas formerly used as sanitary equipment showrooms. The firm will in future concentrate on extensions in their manufacturing programme at their Ipswich Works. The Leman Street telephone number is Royal 7343, and the telegraphic address "Cranelon Phone," London.

Contracts Advertised To-Day.

Pipes and Specials.

The Clacton Urban District Council invite tenders for cast iron pipes and specials. [Advert. on p. 420.]

Corporation Undertakings' Results.

Macclesfield.

In his annual report for the year ended March 31, 1932, Mr. H. Curtis, Engineer and Manager of the Macclesfield Gas Department, recorded an increase in consumption amounting to 36,789 therms—2·32 p.ct. above last year's figures. The total quantity of gas made was 1,671,650 therms, at the declared value of 420 B.Th.U. gross, including 5787 therms of water gas, equivalent to 101·93 therms per ton of coal carbonized. Gas unaccounted for was 3·11 p.ct. The net cost of gas—*i.e.*, coal and oil less residuals—was 1·7237d. per therm sold; the gross cost was 5·3927d., and the average price realized 5·631d. per therm sold. Perhaps the most interesting feature of this undertaking is the energetic sales policy pursued. The number of gas cookers in use at the end of the year was 6272, of which 2192 were purchased by consumers—an increase of 330 on the previous year's figure. No fewer than 3836 gas fires are in use, of which 2925 are the property of the consumers. The standard price of gas supplied through ordinary meters is 7·5d. per therm, with a reduction of 0·5d. when a consumption of 40 therms per quarter is reached, and a sliding scale to 6d. per therm at a consumption of 350 therms and over. Further, there is a discount for cash of 7½ p.ct. during the winter, and no less than 30 p.ct. in the summer. For power, the standard price is 6d. per therm, reducing to 4d. per therm for quantities in excess of 5000 therms per quarter, with similar discounts. Lists are issued to consumers, showing, on similar lines to a "ready reckoner," the actual amount of money chargeable for any given quantity of gas, graduated in units of 100 c.ft. from that figure to 83,900 c.ft. through ordinary meters, with a parallel column showing the equivalent in therms, while for power consumption the scale of charges is graduated from 1-5100 therms. The consumer can thus see at a glance how much his quarter's bill will be. The interesting features of these charges are, first, the very low figure at which definite and substantial inducements are offered to the domestic consumer, and, secondly, the heavy reductions in the summer quarters. It is intended to increase the summer sales to equalize and stabilize the demand on the manufacturing plant, as far as possible. We understand that a fair measure of success in this direction has been achieved.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see earlier pages.]

Issued	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Aug. 19.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
1,551,868	Stk.	Apl. 4	7⅜	7⅜	Alliance & Dublin Ord. ...	100—110	...	101½—101
374,000	,,	July 4	4	4	Do. 4 p.c. Deb. ...	80—90	+7½	...
557,655	,,	Mar. 14	7	7	Barnet Ord. 7 p.c.	135—145	...	...
300,000	1	Apl. 29	1/4¹	1/9¹	Bombay, Ltd.	15/—20/-	...	...
177,750	Stk.	Feb. 29	9	9	Bournemouth sliding scale	180—190	...	...
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	137—147	...	...
439,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	130—135	...	...
50,000	,,	June 20	3	3	Do. 3 p.c. Deb. ...	70—75	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	90—95	...	...
210,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
					Brighton, Hove, & Worthing			
357,900	,,	Mar. 14	7½	7½	6 p.c. Con. ...	135—145	...	144
540,000	,,	,,	6½	6½	Do. 5 p.c. Con. ...	120—130	...	127½
195,500	,,	,,	6	6	Do. 6 p.c. B Pref.	129—134	...	...
1,287,500	,,	Aug. 8	5	5	Bristol 5 p.c. max.	107—109a*	...	...
120,420	,,	June 20	4	4	Do. 1st 4 p.c. Deb. ...	92—94a	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	90—94a	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	115—120a	...	...
855,000	,,	Apl. 4	7	8	British Ord.	132—142	...	131—136
100,000	,,	June 20	7	7	Do. 7 p.c. Pref.	120—130	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	87—92	...	91
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	105—115	...	...
160,000	,,	July 4	5	5	Cambridge 5 p.c. Deb. ...	114—119	...	...
100,000	10	May 23	6	6	Cape Town, Ltd.	7¾—8¼	...	...
100,000	10	Apl. 29	4½	4½	Do. 4½ p.c. Pref. ...	6—7	...	...
150,000	Stk.	June 20	4½	4½	Do. 4½ p.c. Deb. ...	80—90	...	...
626,860	,,	Aug. 8	6	6	Cardiff Con. Ord.	98—103*	...	...
237,860	,,	July 4	2⅜	5	Do. * 5 p.c. Red. Deb.	105—110	...	...
157,150	,,	Aug. 8	6½	5	Chester 5 p.c. Ord.	89—94f*	...	...
98,936	1	May 23	2/-	2/-	Colombo, Ltd. Ord.... ...	26/—31/-	...	...
24,500	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	18/—20/-	+1/-	...
609,204	1	Apl. 4	-/10'90	-/11'47	Colonial Gas Assn. Ltd. Ord.	10/—15/-	...	...
296,053	1	,,	1/2 54	1/3'30	Do. 8 p.c. Pref.	10/—15/-	...	...
2,073,280	Stk.	Aug. 8	5⅔	5	Commercial Ord.	102—107†	...	103½
475,000	,,	June 20	3	3	Do. 3 p.c. Deb. ...	70—75	...	...
807,560	,,	Aug. 8	7	7	Croydon sliding scale	130—140*	...	...
469,590	,,	,,	5	5	Do. max. div.	95—100*	...	97
500,000	,,	July 4	5	5	Do. 5 p.c. Deb.	115—120	...	118—119⅞
544,270	,,	Aug. 8	10	7	Derby Con.	120—130c*	...	...
55,000	,,	July 4	4	4	Do. 4 p.c. Deb.	75—85c	...	...
209,000	,,	Mar. 14	5	5	East Hull Ord. 5 p.c. ...	95—100	+1	...
179,500	,,	Feb. 29	5⅔	5⅔	East Surrey Ord. 5 p.c. ...	110—120	...	...
155,019	,,	June 20	5	5	Do. 5 p.c. Deb. ...	114—119	...	...
1,002,180	,,	Mar. 14	14	16⅔	European, Ltd.	98—108	...	102½—106
19,405,992	,,	Aug. 8	5⅔	5⅔	Gas Light & Coke 4 p.c. Ord.	22/—24/-g*	-/6	22/6—23/4½
2,600,000	,,	,,	3⅔	3⅔	Do. 3⅔ p.c. max.... ...	80—85*	...	80⅝—82⅜
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	95—100*	...	97⅛—98⅛
6,102,497	,,	June 20	3	3	Do. 3 p.c. Con. Deb. ...	75—80	...	76⅛—78⅛
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	108—113	...	108—112
2,500,000	,,	,,	4⅔	4⅔	Do. 4⅔ p.c. Red. Deb. ...	105—110	...	106⅞—107⅝
264,011	,,	—	—	—	Harrogate New Cons. ...	106—111	...	...
82,500	,,	Mar. 14	7	7	Hastings & St. L. 5 p.c. Conv.	120—130	...	...
258,740	,,	,,	5⅔	5⅔	Do. 3⅔ p.c. Conv.	90—95	...	...
70,000	10	June 6	15	10	Hongkong & China, Ltd. ...	10—11	...	...
213,200	Stk.	Feb. 29	6	6	Hornsey Con. 3½ p.c. ...	105—110	...	...
5,600,000	,,	June 6	15	14	Imperial Continental Cap.	187—197	...	193—196½
223,130	,,	Aug. 8	3⅔	3⅔	Do. 3⅔ p.c. Red. Deb.	81—86*	...	...
235,242	,,	Aug. 8	8⅔	8⅔	Lea Bridge 5 p.c. Ord. ...	142—152*	...	...
2,145,907	,,	Feb. 29	6	6	Liverpool 5 p.c. Ord. ...	111½—112½b	...	...
245,500	,,	June 20	5	5	Do. 5 p.c. Red. Pref. ...	100—110b	...	...
306,083	,,	July 15	4	4	Do. 4 p.c. Deb. ...	85½—90½b	...	...
165,786	,,	Feb. 15	8	10	Maidstone 5 p.c. Cap. ...	155—165	...	...
56,176	,,	June 20	3	3	Do. 3 p.c. Deb. ...	65—70	...	...
75,000	5	June 20	110	110	Malta & Mediterranean ...	7⅛—8⅛	...	8 3/16
					Metropolitan (of Melbourne)			
892,000	—	Apl. 1	5⅔	5⅔	5⅔ p.c. Red. Deb.	95—100	...	...
171,978	Stk.	Feb. 29	5	5	M. S. D. Utility "C." Cons.	88—93	...	...
718,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	82—87	...	...
112,126	,,	July 4	4	4	Do. 4 p.c. Deb. ...	87—92	...	...
148,955	,,	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...	...
675,000	,,	21 May '31	16	16	Montevideo, Ltd.	40—60	...	...
2,061,315	,,	Aug. 8	5⅔	5	Newcastle & Gateshead Con.	20/—21/-d/*	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	89½—90½d*	...	...
691,705	,,	June 20	3⅔	3⅔	Do. 3⅔ p.c. Deb. ...	88—90d	...	...
277,285	,,	Apl. 29	5	5	Do. 5 p.c. Deb. '43...	105—110d	...	...
274,000	,,	Aug. 8	5	5	Newport (Mon.) 5 p.c. max.	86—87a*	...	...
199,940	,,	Mar. 14	7⅛	7⅛	North Middlesex 6 p.c. Con.	135—145	...	...
896,160	,,	Aug. 8	5	5	Northampton 5 p.c. max. ...	88—93*	...	...
300,000	,,	Apl. 18	9	7	Oriental, Ltd.	85—95	...	...
205,162	,,	June 20	8	8	Plym'th & Stonehouse 5 p.c.	140—150	...	...
504,416	,,	Feb. 15	8	8	Portsm'th Con. Stk. 4 p.c. Std.	140—150	...	143
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	90—95	...	...
114,000	,,	Aug. 8	5	5	Preston 5 p.c. Pref.	100—105*	...	...
686,312	,,	July 18	4	4	Primitiva 4 p.c. Rd. Db. 1911	75—80*	...	...
389,813	,,	June 20	4	4	Do. 4 p.c. Cons. Deb.	76—81	...	...
150,000	10	Apl. 4	6	6	San Paulo 6 p.c. Pref. ...	7—7½	...	...
1,786,968	Stk.	Apl. 4	6	6	Sheffield Cons.	108—112a	...	...
95,000	,,	July 18	4	4	Do. 4 p.c. Deb.	90—94c	...	...
138,201	,,	Feb. 29	8⅔	5	Shrewsbury 5 p.c. Ord. ...	110—115	...	...
90,000	10	June 6	15	15	South African	4—6	...	...
6,709,895	Stk.	Aug. 8	7	5	South Met. Ord.	115—118*	...	115—118
1,185,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	130—135*	...	131—133
1,895,445	,,	July 4	3	3	Do. 3 p.c. Deb. ...	75—80	...	75½—78
1,000,000	,,	July 18	4	5	Do. 5 p.c. Red. Deb.	108—113	...	112—112½
91,500	,,	Feb. 29	8⅔	8⅔	South Shields Con.	129—131d	...	...
1,543,795	,,	Aug. 8	6	6	South Suburban Ord. 5 p.c.	115—120*	...	115½
300,000	,,	,,	5	5	Do. 5 p.c. Pref.	108—113*	...	...
668,887	,,	June 20	5	5	Do. 5 p.c. Deb.	116—121	...	112—120½
647,740	,,	Feb. 29	5	5	Southampt'n Ord. 5 p.c. max.	95—100	...	...
121,275	,,	June 20	4	4	Do. 4 p.c. Deb.	90—95	...	...
200,000	,,	June 20	6⅔	6⅔	Swansea 6⅔ p.c. Red. Deb.	105—110	...	...
1,076,490	,,	Aug. 8	6⅔	6⅔	Tottenham and District Ord.	127—132*	...	128
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COMPANY NOTICES.

THE COMMERCIAL GAS COMPANY.

NOTICE is Hereby Given that an EXTRAORDINARY GENERAL MEETING of the Commercial Gas Company will be held at the Great Eastern Hotel, Liverpool Street Station, in the City of London, on Thursday, the 8th of September, 1932, at Twelve o'clock noon, for the purpose of submitting to the Proprietors for their consideration and approval the following Resolutions:

That the Directors be and they are hereby authorized to create and issue under the powers of the Commercial Gas Acts 1902, 1918, and 1932 and/or the Gas Undertakings Act 1929, at such times in such amounts and manner and on such terms as they may think fit Five per centum Debenture Stock not exceeding in the whole the nominal sum of £350,000.

Dated this 18th day of August, 1932.

By order of the Board,
F. J. BRADFIELD,
General Manager and Secretary.

Chief Offices,
Harford Street,
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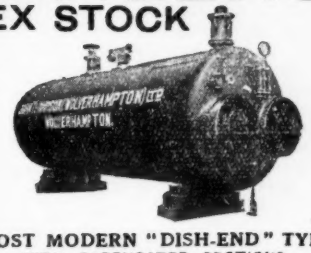

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